FACTORS CONTRIBUTING TO HIGH NEONATAL DEATH RATES IN A DISTRICT HOSPITAL IN THE MPUMALANGA PROVINCE

by

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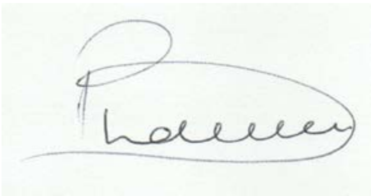
Student number: 3116 041 7

I declare that **FACTORS CONTRIBUTING TO HIGH NEONATAL DEATH RATES IN A DISTRICT HOSPITAL IN THE MPUMALANGA PROVINCE** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.



10 February 2012

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ABSTRACT

The purpose of the research was to determine the underlying contributory factors in an obstetric unit at the district hospital in Mpumalanga province, South Africa, regarding neonatal deaths and to propose strategies for midwifery practice. Quantitative, non-experimental, descriptive, exploratory and retrospective (ex-post facto) design was used to explore and describe the factors contributing to neonatal deaths. Data collection was done using an audit tool.

The conclusions drawn from this study supported the assumptions that there are factors related to antenatal, intrapartum, postnatal and neonatal care that contribute to neonatal deaths, thus emphasizing the urgency of improving the care of pregnant mothers and their babies through effective implementation of programmes and protocols.

KEY CONCEPTS

Neonatal deaths/mortality, antenatal care, intrapartum care, neonatal care, postnatal care, risk factors.

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DEDICATION

I dedicate this study to my children, Nkhensani, Karabo, Vunene, Bonolo, my husband, Philip, my sister, Toriso, my brother, Tirelo, for their love, support and encouragement, without whom this would not have been possible.

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List of abbreviations

AIDS	Acquired Immuno Deficiency Syndrome
AZT	Azidothymidine
BBA	Born before arrival
cm	Centimeters
CPD	Cephalopelvic disproportion
DoH	Department of Health
ENND	early neonatal death
g	grams
g/dl	grams per deciliter
Hb	Haemoglobin
HIV	Human Immunodeficiency Virus
Kg	Kilograms
Km	Kilometers
KMC	Kangaroo Mother Care
LBW	Low birth weight infant
LINC	Limpopo Initiative in Neonatal Care
LNND	Late neonatal death
MCWH	Maternal, child and women's health
MDGs	Millennium Development Goals
Ml	Milliliters
mmHg	Millimeters of mercury
MSL	Meconium stained liquor
AGA	Average for gestational age infant
LGA	Large for gestational age infant
NMR	Neonatal mortality rate
NND	Neonatal death
NNDR	Neonatal death rate
PACES	Practical application of clinical evidence system
PEP	Perinatal Education Programme
PNMR/PMR	Perinatal mortality Rate
PPIP	Perinatal Problem Identification Programme
RPR	Rapid plasma regain
SANC	South African Nursing Council

List of abbreviations

SAS JMP	Statistical Analysis System of John's Macintosh Project
SFH	Symphysis fundal height
SGA	Small for gestational age infant
VCT	Voluntary Counseling and Testing
VDRL	Venereal Disease Research Laboratory
WHO	World Health Organization

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

On 8 September 2000 the global community declared its commitment to "create an environment at the national and global levels which is conducive to development and to the elimination of poverty" (Pattinson 2003–2005:1). Eight goals, the Millennium Development Goals (MDGs), were adopted by the global community (Pattinson 2003–2005:1). Three of these directly relate to maternal and child health:

- MDG number 4 relates to the reduction of child mortality in children under five years of age by two-thirds between 1990 and 2015, which "remains unacceptably high" (United Nations 2008:20).
- MDG number 5 is to improve maternal health by reducing maternal mortality by three-quarters between 1990 and 2015. The incidence of mothers dying in pregnancy or childbirth is high in sub-Saharan Africa and Southern Asia (United Nations 2008:24).
- MDG 6 is to combat the Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS), malaria and other diseases by halting HIV/AIDS by 2015 and beginning to reverse the spread of HIV/AIDS which is regarded as continuing to increase in sub-Saharan Africa (United Nations 2008:28).

Rutherford, Mulholland and Hill (2010:508) indicated that 9.7 million children worldwide aged under-five die annually and 41% of these deaths occur in sub-Saharan Africa.

According to Osrin (2010:1039), perinatal conditions make the largest contribution to the burden of disease in low-income countries; and stillbirth and early neonatal mortality rates remain high in many countries in Africa and Asia, especially around the time of birth.

Warren, Daly, Toure and Mongi (2006:80) state that sub-Saharan Africa has the highest rates of neonatal mortality in the world and has shown the slowest progress in reducing newborn deaths, especially deaths in the first week of life.

According to Pattinson (2003–2005:4), in South Africa an estimated 23 000 babies die in the first month of life each year, despite greater national wealth and rapid economic growth. A reduction in the neonatal mortality rate would result in a reduction in the perinatal mortality rate. Achieving MDG number 4 and MDG number 5 necessitates improvements in the quality of care received by pregnant women and their infants and ensuring that health system is appropriately structured and functioning properly (Pattinson 2003–2005:1).

1.2 BACKGROUND TO THE RESEARCH PROBLEM

Neonatal deaths account for a large proportion of child deaths in the world. Babies in developing countries are five times more susceptible to dying before or just after birth than those in the industrialised world (World Health Organization (WHO) 2007a:15). In addition, Johnston, Flood and Spinks (2004:4), in their study in the United Kingdom, found that a quarter of neonatal deaths occur in babies weighing more than 2500 grams (g).

Lawn, Mongi and Cousens (2006:14) state that Africa accounts for 11% of the world's population but more than 25% of the world's newborn deaths. Of the 20 countries in the world with the highest risk of neonatal death, 75% are in Africa (see table 1.1).

Table 1.1 The 10 African countries where newborns are at the highest risk of dying

COUNTRY		NEONATAL MORTALITY RATE PER 1000 LIVE BIRTHS
1	Liberia	66/1000
2	Côte d'Ivoire	65/1000
3	Mali	57/1000
4	Sierra Leone	56/1000
5	Angola	54/1000
6	Somalia	49/1000
7	Guinea-Bissau	48/1000
8	Central African Republic	48/1000
9	Nigeria	48/1000
10	Democratic Republic of Congo	47/1000

(Lawn et al 2006:14)

In table 1.1, it is noticeable that South Africa is not listed as one of the ten highest risk countries for newborn deaths. Liberia is the highest risk country, with a neonatal mortality rate of 66/1000; the Democratic Republic of Congo is the lowest of the ten, with a neonatal mortality rate of 47/1000.

In a study conducted in India by Baqui, Darmstadt, Williams, Kumar, Kiran, Panwar, Srivastava, Ahuja, Black and Santosham (2006:706), found that the neonatal death rate was 43/1000 as compared with the study conducted in rural Vietnam by Graner, Klingberg-Allvin, Phuc, Huong, Krantz and Mogren (2010:539) which found that the neonatal death rate was 11.6/1000 and the proportion of early neonatal deaths to all neonatal deaths was at 80%.

A study conducted in China by Huo, Zhao, Feng, Yao, Sävman, Wang and Zhu (2010:344), found that the perinatal mortality rate was significantly higher in rural areas than in urban areas for every year during the five years of the study.

Pattinson (2003–2005:18) states that “every year in sub-Saharan Africa 1.16 million babies die in the first month of life, and another million babies are stillborn”.

In figure 1.1, South Africa’s position is compared with that of five other countries in the sub-Saharan region.

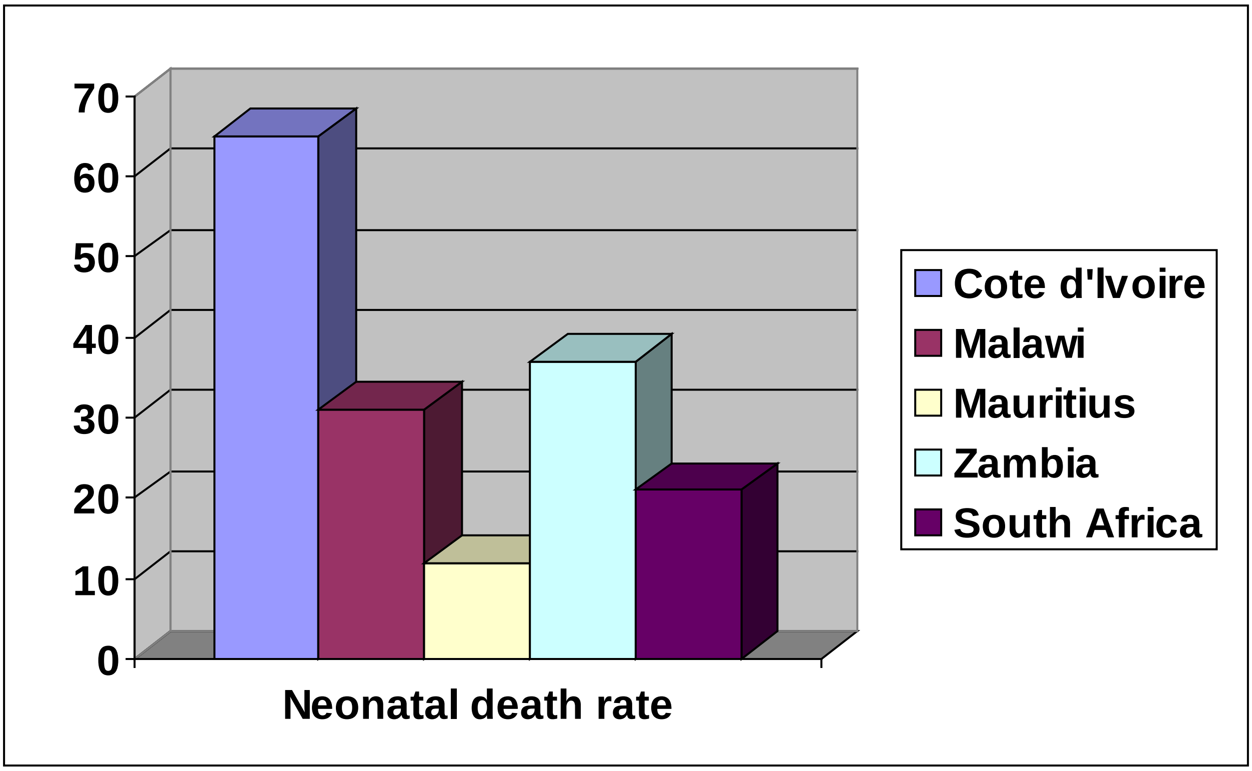

Figure 1.1 Comparison of neonatal death rate between the sub-Saharan African countries

(Pattinson 2003–2005:19)

The above figure indicates that South Africa compares adequately with other sub-Saharan countries with the neonatal death rate of 21/1000.

According to Woods (2009:275), the perinatal mortality rate for infants weighing 500 g or more in South Africa is an estimate of 55/1000 and varies between different areas, from 35/1000 in metropolitan areas to over 100/1000 in rural areas where poverty is rife.

In table 1.2, the perinatal and neonatal death rates in South Africa from 2001 to 2005 are compared between metropolitan areas, cities and towns and rural areas.

Table 1.2 Comparison between the perinatal mortality rate and neonatal death rate in the different areas in South Africa

AREA	2001		2003		2003–2005	
	Perinatal mortality rate	**Neonatal death rate**	**Perinatal mortality rate**	**Neonatal death rate**	**Perinatal mortality rate**	**Neonatal death rate**
South Africa	35/1000	-	27.63/1000	9.90/1000	33.6/1000	21/1000
Metro-politan areas	38.4/1000	10.7/1000	24.24/1000	7.41/1000	24.8/1000	8.0/1000
Cities & Towns	43.4/1000	16.5/1000	32.56/1000	12.58/1000	30.2/1000	10.2/1000
Rural areas	25.5/1000	11.1/1000	25.18/1000	10.83/1000	30.5/1000	11.3/1000

(Pattinson 2001:10; 2003:4; 2003–2005:3)

According to the above table, the perinatal mortality rate for South Africa in 2001 was 35/1000. In 2003 it showed a decrease to 27.63/1000 and between 2004 and 2005 it increased to 33.6/1000 of babies weighing 1000 g and more. In rural areas the perinatal mortality rate has increased from 25.5/1000 in 2001 to 30.5/1000 in 2003–2005.

The 2001 neonatal death rate for South Africa was not indicated, but in 2003 the neonatal death rate was 9.9/1000, which has more than doubled in the 2003–2005 period to 21/1000. In rural areas, the neonatal death rate is consistent around 11/1000.

In table 1.3, the perinatal and neonatal death rates per province in South Africa are compared.

Table 1.3 Comparisons of the provincial perinatal mortality rate and neonatal death rate in South Africa

PROVINCE	2001		2003		2003–2005	
	Perinatal mortality rate	Neonatal death rate	Perinatal mortality rate	Neonatal death rate	Perinatal mortality rate	Neonatal death rate
Eastern Cape	37/1000	14/1000	-	-	25.5/1000	8.2/1000
Free State	46/1000	12/1000	41.7/1000	10.9/1000	24/1000	9.8/1000
Gauteng	38/1000	13/1000	30.7/1000	9.7/1000	25.5/1000	9.4/1000
KwaZulu-Natal	36/1000	14/1000	30.6/1000	12.9/1000	34.1/1000	15/1000
Limpopo	31/1000	12/1000	28.8/1000	11.5/1000	30.4/1000	11.2/1000
Mpumalanga	39/1000	17/1000	34.3/1000	10.5/1000	29.7/1000	9.5/1000
North West	44.1/1000	18/1000	41.1/1000	15/1000	34/1000	12.4/1000
Northern Cape	38/1000	12/1000	30.0/1000	11/1000	44.9/1000	14.3/1000
Western Cape	19/1000	4/1000	33/1000	11/1000	-	-

(Pattinson 2001:41; 2003:127; 2003–2005:107)

The above table shows a decrease in the perinatal mortality rate (PNMR) from 39/1000 in 2001 to 34.3/1000 in 2003 in Mpumalanga. The perinatal death rate further decreased between 2003 and 2005 to 29.7/1000.

Figure 1.2 compares the perinatal mortality rate and neonatal death rate (NNDR) among the three districts of the Mpumalanga province.

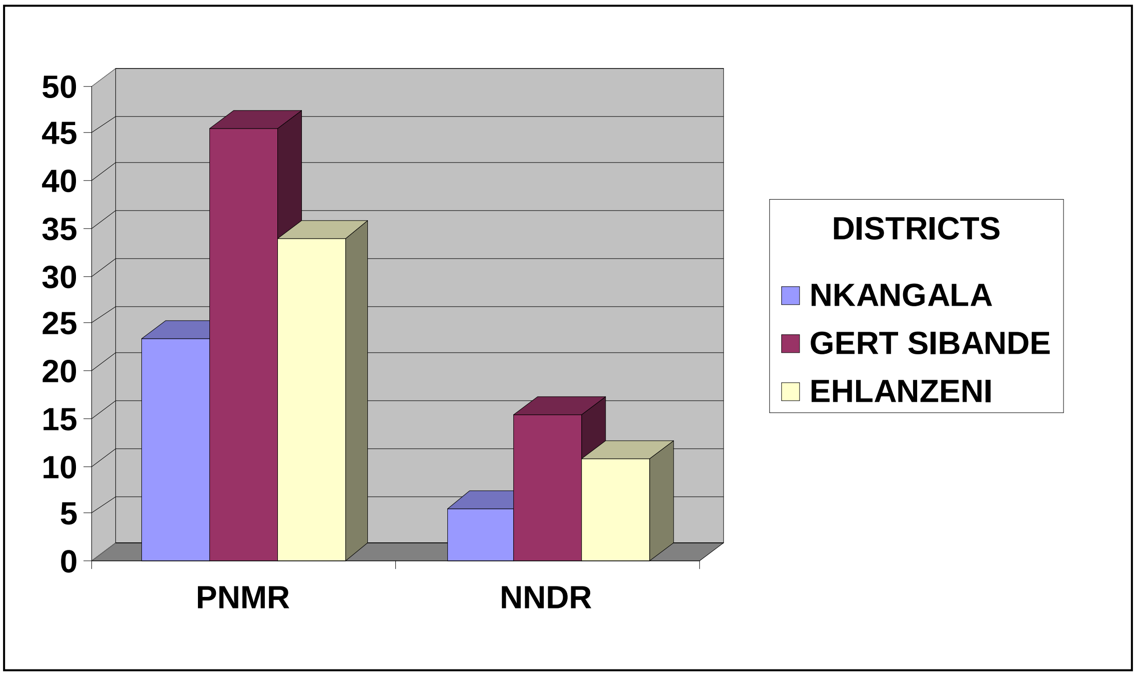

Figure 1.2 Comparison of the perinatal mortality rate and neonatal death rate between the three districts of Mpumalanga province

(Pattinson 2003:143)

The Ehlanzeni District has a higher perinatal and neonatal death rate than the Nkangala District but a lower perinatal and neonatal death rate than the Gert Sibande District.

The perinatal death rate of the hospital under study ranged between 13.8 and 38.8/1000, and the neonatal death rate ranged between 9.2 and 22/1000 between the months of April to March 2007 to 2008 (District Health Information System (DHIS) 2007–2008). This rate is comparable to the perinatal death and neonatal death rates in the Ehlanzeni district, in which this hospital is situated.

1.3 DEMOGRAPHIC AND GEOGRAPHICAL INFORMATION OF THE CONTEXT

The study is conducted in a Level 1 hospital in the Ehlanzeni District, one of the districts in Mpumalanga province in South Africa.

1.3.1 Mpumalanga province

The Mpumalanga province is situated in the eastern part of South Africa and is bordered by four of the nine provinces: the Gauteng, Free State, KwaZulu-Natal and Limpopo provinces. It shares international borders with two countries, Mozambique and Swaziland. The location of the Mpumalanga province subjects it to cross-border influx of patients from neighbouring provinces as well as the two neighbouring countries. The province is made up of three districts, namely Ehlanzeni, Nkangala and Gert Sibande. The Mpumalanga province has an estimated population of 3.5 million (7.4% of South Africa's population) (Pattinson 2003–2005:134).

The population of the province is relatively young, with 35% of the population being younger than 15 years of age. The province is mostly rural, 66% of the population live in rural areas. The largest rural population is in the Ehlanzeni District, due to the addition of the Bushbuckridge Local Municipality. The provincial unemployment rate is 26.9% and the total dependency ratio is 64% (Pattinson 2003–2005:134).

1.3.2 Bushbuckridge Local Municipality

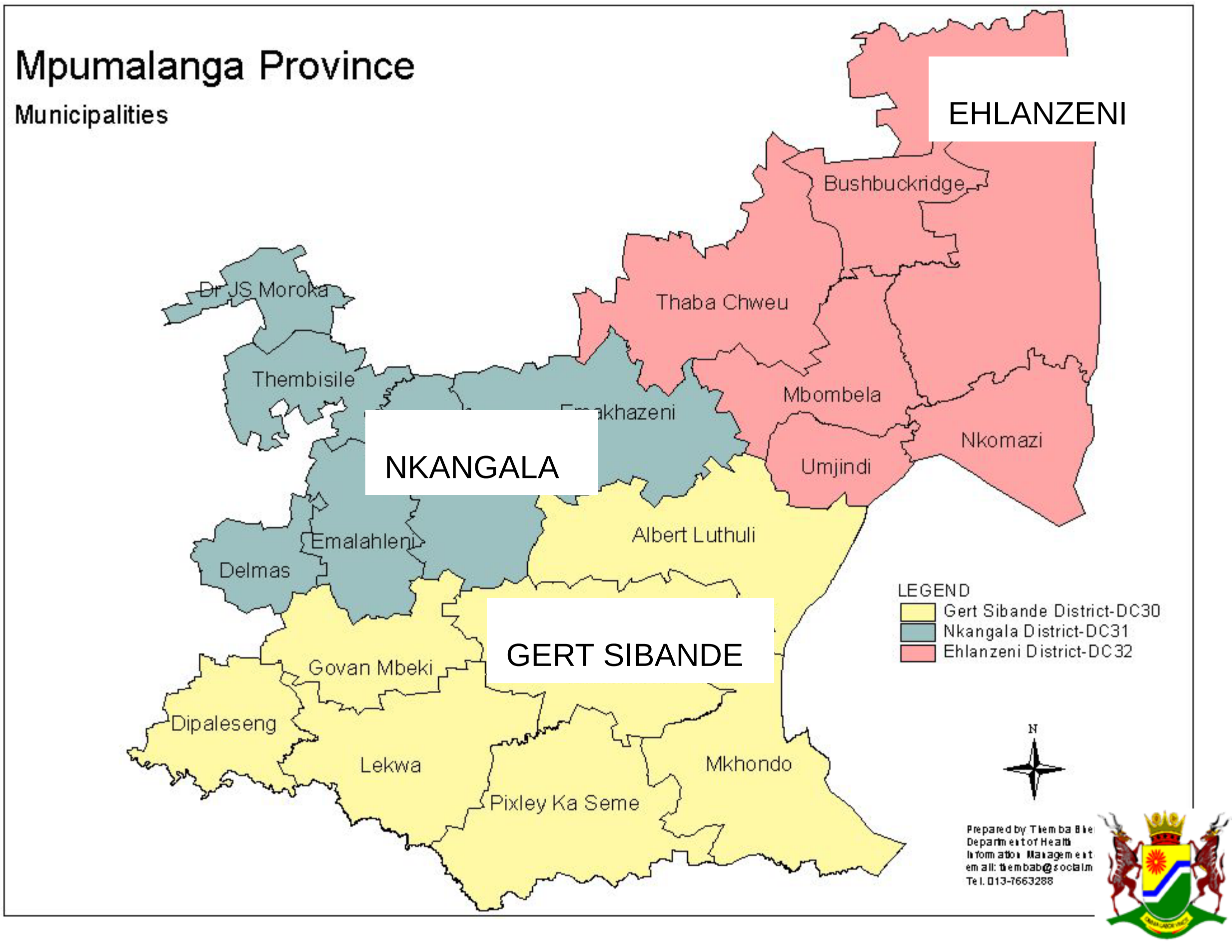

Figure 1.3 Map showing Mpumalanga province and its municipalities
(Department of Health (DoH) 2006:1)

Bushbuckridge Local Municipality is a presidential nodal point located in the north-eastern part of the Mpumalanga province. It is one of the five local municipalities of the Ehlanzeni District, and is bordered by the Kruger National Park in the east and Mbombela Local Municipality in the south. It forms part of the Kruger-to-Canyon Biosphere (Morema 2007–2008:9).

The Ehlanzeni District is bordered by the Maruleng Local Municipality and the Mopani District in the north and in the west by the Fetakgomo Local Municipality, in the south by the Thaba Chweu and Mbombela Local Municipalities. The unemployment rate is at 85% in the municipal area and especially in the rural areas, with less than 15% of the total population being employed. This fact contributes to the level of poverty, which is increasing due to the rise of living costs and the low income per household, which is below the subsistence income levels (Morema 2007–08:9).

1.3.3 District health facilities

There are eleven hospitals in the Ehlanzeni District. Of these, three are Level ll hospitals and eight are Level l hospitals. There are no Level lll hospitals in the district (Pattinson 2003–2005:135). Patients who need more advanced treatment are taken by ambulance to Level III hospitals in Gauteng and Limpopo.

1.3.3.1 Levels of care

There are three levels of care as described by the DoH, that is, Level I hospital care, Level II hospital care and Level III hospital care (DoH 2007:15).

- **Level 1 hospital care**

According to the DoH (2007:15) a Level l hospital is a district hospital that is normally a base for providing health care to rural areas and should be staffed with advanced midwives, midwives with additional training in perinatal care, enrolled nurses, nursing auxiliaries, social workers, full-time medical officers and visiting specialist obstetricians.

Level 1 hospitals offer services for antenatal care to women who are regarded as at high risk, for example those with pregnancy-induced hypertension and gestational diabetes. Investigations done at these facilities include on-site blood testing, a 24-hour labour and delivery service for women who are intermediate or regarded as a high risk, vacuum extraction, caesarean section, manual removal of the placenta and regional and general anaesthesia. It is also a referral centre for clinics and community health centres in the district (DoH 2007:15). This description of a Level I hospital is supported by Kibel, Saloojee and Westwood (2007:213), who state that a Level I hospital is a district hospital and should be staffed by professional nurses and doctors who provide care for common conditions that need hospital management. The Level I hospitals are allocated to the periurban or rural areas. The neonatal facilities at a Level I hospital deal with normal preterm infants including Kangaroo Mother Care (KMC), administering of oxygen therapy for the mother and the baby, phototherapy for neonatal jaundice and for treating sepsis. These should be adequately equipped with, for example, phototherapy lamps, oxygen apparatus and incubators that can be used to transfer neonates to Level II hospitals.

- **Level II hospital care**

A Level ll hospital is a regional hospital, as it is a base hospital for providing healthcare at a regional level. The Level II hospital caters for the communities in a number of districts. It functions as the referral hospital for Level I hospitals and nearby clinics and community health centres. It has all the functions of a Level I hospital, but in addition it is able to provide services for severely ill pregnant women and specialist supervision of the care of pregnant women. It is a referral hospital for Level l hospitals in the region. It should be staffed with advanced midwives, midwives with additional training in perinatal care, enrolled nurses, nursing auxiliaries, full-time doctors and full-time specialist obstetricians and should have an intensive care unit (DoH 2007:16).

Kibel et al (2007:214) point out that a Level II hospital is a regional hospital catering for two groups of patients: those referred from the region who need specialist attention, and those patients who use the regional hospital as their local district hospital. It is should be staffed by resident specialists, and 95% of all patients should be able to be treated without needing to be referred for more specialised care.

- **Level III hospital care**

A Level lll hospital is a central or tertiary hospital which has all functions of a Level l combined with specialist clinics, advanced prenatal diagnosis, and management of extremely ill or difficult obstetric patients. It supervises and supports Level l and Level ll hospitals and is responsible for policy and protocol in the regions it serves. It should be staffed by all the staff in Level l and ll hospitals and full-time specialist obstetricians including those with subspecialty skills (DoH 2007:16).

In support, Kibel et al (2007:216) describe a Level lll hospital as a sub-specialist hospital which serves a large population and involves university teaching facilities. Patients are referred from regional centres.

The hospital in which this study was conducted (referred to as “hospital A”) is a Level l hospital. It is a rural hospital in the town of Acornhoek in Bushbuckridge Local Municipality. It has 14 feeder clinics in a radius of eight kilometres (km) to 60 km (DHIS: 2009:5).

The following reproductive services are offered at the level 1 hospital:

- Women’s health care services (Gynaecology clinic)
- Reproductive health services
- Sexually transmitted infections services
- Voluntary counseling and testing services
- Prevention of mother-to-child transmission services
- Antiretroviral therapy services
- Antenatal care services
- Labour and delivery including caesarean section services
- Postnatal care services
- Neonatal care services
- Well baby care, including immunisation services

1.3.4 Population and distances of the referring clinics from the hospital under study

Figure 1.4 indicates the distances of the clinics in the Bushbuckridge municipality which are dependent on the services of this district hospital. The distances range from a radius of eight km to 60 km, taking into consideration the scarce transport facilities in these areas. The total population expected to be catered for by the hospital is 611 043.

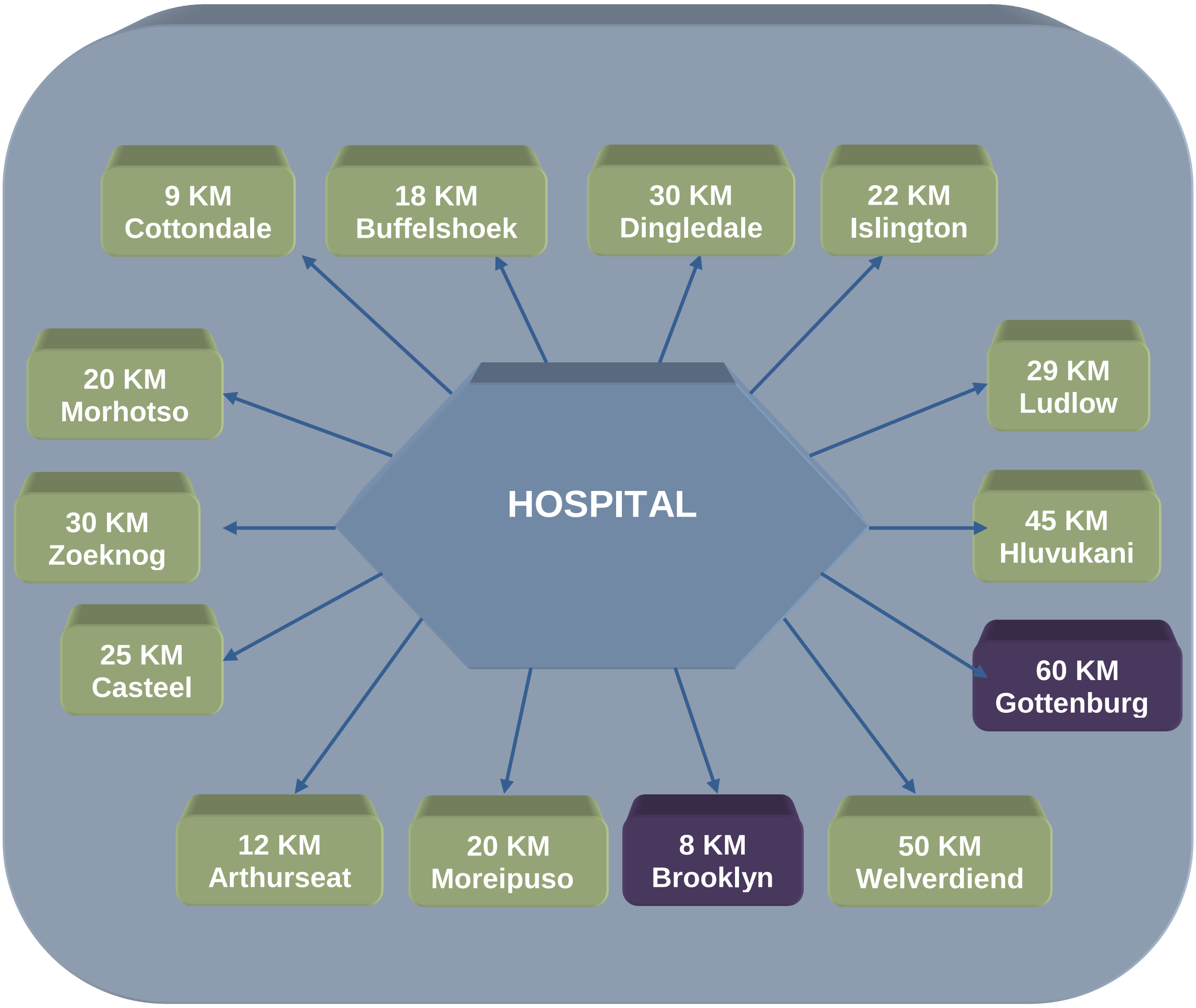

Figure 1.4 Diagram showing population and distances of clinics referring patients to the hospital under study

(DHIS 2009:5)

In figure 1.4 the distances are given between the clinics in Bushbuckridge municipality and the hospital under study. From the figure above it is evident that the distances are in an average of eight km to 60 km.

1.3.5 Training programmes offered at the hospital

The hospital is a training institution for the Diploma in Midwifery (R254 of 25 February 1975 as amended) accredited by the South African Nursing Council (SANC). The Perinatal Education Programme (PEP) courses are offered to the registered midwives, enrolled nurses and enrolled auxiliary nurses as a continuing education programme, and to student midwives. It is also a clinical facility for the four-year comprehensive nursing programme (R425 of 25 February 1985, as amended).

Since 1996 the paediatric consultants from Baragwanath Hospital had been visiting the hospital for management of neonatal and paediatric abnormalities and illnesses. These consultants introduced the PEP and it has been running since. In-service education on the management of neonatal abnormalities and illnesses is offered to midwives in the maternity unit according to their needs.

The maternal and child health department in Limpopo developed a programme, referred to as the Limpopo Initiative in Neonatal Care (LINC). Workshops were offered to enrolled nurses, enrolled auxiliary nurses, midwives and doctors on the management of neonatal abnormalities and illnesses. The training was provided over a period of two weeks through workshops presented by paediatric specialists and neonatologists three times a year.

1.3.6 The capacity and human resource of the hospital

The obstetric unit of the hospital under study is a 119-bed unit, where 25 beds are for the antenatal unit, 69 beds for the postnatal unit, nine for the delivery unit and 16 for the neonatal unit. It is staffed with 20 registered midwives who are allocated to the antenatal unit, labour unit, neonatal unit and postnatal unit, seven enrolled nurses and 19 enrolled auxiliary nurses for both day and night shifts according to the allocation records of the maternity unit.

1.3.7 Deliveries in 2007–2008 in the hospital

Table 1.4 Deliveries from April 2007 to March 2008

	2007									2008			
Deliveries	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Total**
Mothers <18 years	65	54	45	17	56	69	45	42	43	39	36	60	**571**
Live birth HIV positive mothers	47	28	21	30	28	47	33	37	57	41	69	60	**498**
Normal deliveries for all ages	372	365	341	348	353	420	306	307	374	399	392	449	**4426**
Forceps deliveries	4			5	2		3	2	4				**20**
Vacuum deliveries	0	0	0	0	0	0	3	0	0	0	0	0	**3**
Caesarean Section	46	57	39	53	60	55	54	47	44	49	45	49	**598**
Preterm del./LBW	44	46	32	27	41	42	31	44	62	48	102	122	**641**
Total deliveries	**418**	**422**	**380**	**401**	**413**	**475**	**360**	**354**	**418**	**447**	**437**	**498**	**5023**

(Mpumalanga Health Management Information System (HMIS) 2007–2008)

Table 1.4 shows the annual deliveries from April 2007 to March 2008. According to the suggested staffing norms by Pattinson (2003–2005:25), there should be 16 midwives per 100 deliveries per month, two to three midwives per 100 bookings per month and at least one professional nurse to cover the neonatal unit on the staff establishment at a Level l health care facility.

The above table indicates the teenage delivery rate in September 2007 as 69 deliveries of mothers younger than 18 years, and April at 65 deliveries, as compared with the other months. The number of live births to HIV mothers increased significantly from 20–40 to 57–69 in the months of February and March 2008. In August 2007 there were 60 caesarean sections as compared to the other months of 39–55. During February and March 2008 there were almost double the number of babies delivered prematurely or with a low birth weight.

1.4 STATEMENT OF THE PROBLEM

Polit and Beck (2008:92) define a problem statement as an expression of the dilemma or disturbing situation that needs investigation for the purpose of providing understanding and direction.

Despite concentrated efforts to minimise the neonatal mortality rate at the Level I hospital under study through client education, training programmes for doctors and midwives, decentralising of clinic organisation, and free management of pregnant women, the neonatal death rate remains a concern at the hospital. The researcher in this study is interested in studying factors which influence neonatal deaths at the hospital.

1.5 AIM AND PURPOSE OF THE STUDY

The overall aim of the study is to propose strategies to prevent high neonatal death rates at the Level I hospital maternity unit and its feeder clinics.

The purpose of the study is to explore the contributory factors to neonatal deaths at the Level I hospital in the Mpumalanga province where the study was conducted, so as to prevent the high neonatal death rate.

1.6 RESEARCH OBJECTIVES

According to Polit and Beck (2008:81), research objectives are specific accomplishments the researcher hopes to achieve by conducting a study, including obtaining answers to research questions or testing of a hypothesis and some broader aims. The objectives of this study are to

- determine underlying contributory factors to neonatal deaths in an obstetric unit
- propose strategies for midwifery practice in order to prevent neonatal deaths

1.7 ASSUMPTIONS

According to Bethel and Thomas (2006:6), an assumption is a notion that is taken to be true, which may be consistent with particular views of the world and reality. It may be made on the basis of tentative support through previous research. Burns and Grove (2011:37) define an assumption as a statement that is taken for granted or considered true, even though it is not scientifically tested. Assumptions are embedded in the philosophical base of the framework, study design, and interpretation of findings. Theories and research instruments are developed based on assumptions that may or may not be recognised by the researcher. Assumptions influence the development and implementation of the research process. They influence the logic of the study.

The assumption for this study was that there are factors related to antenatal, labour and delivery, postnatal and nursery care that contribute to neonatal mortality.

1.8 SIGNIFICANCE OF THE STUDY

This study hopes to provide information to health care practitioners regarding the contributory factors which may cause neonatal deaths at the hospital.

The findings of the study could have major policy and training implications for midwives at the hospital under study, with resulting improvement in the level of maternal and neonatal care. These findings could also lead to improvements in maternal and neonatal care facilities. New knowledge will be brought to the study depending on the results of the research in order to reduce the neonatal deaths caused by preventable causes. The results could also assist the Department of Health to introduce measures and reinforce existing policies and strategies on obstetric and neonatal care.

1.9 CONCEPTUAL FRAMEWORK/MODEL

A concept is an idea or complex mental image of a phenomenon, which may be an object, property, process or event and is a major component of a theory (Bethel & Thomas 2006:23). This definition is supported by Polit and Beck (2008:749).

A conceptual framework is a set of interrelated concepts that symbolically represent and convey a mental image of a phenomenon. Conceptual models of nursing are described as abstract frames of reference that address the discipline's metaparadigm concepts of persons, the environment, health and nursing (Bethel & Thomas 2006:24; Brink, Van der Walt & Van Rensburg 2007:23; Polit & Beck 2008:141).

Models are graphic or symbolic representations of a phenomenon that serve to objectify and present a certain perspective or point of view about its nature and/or function. Various media are employed in the construction of models, such as plastic models of human organs, chemical structures, diagrams, geometric forms, mathematical formulae/equations and words (Bethel & Thomas 2006:106).

Schematic and statistical models are constructed representations of some aspect of reality; they use concepts as building blocks, with minimal use of words. A visual or symbolic representation of a conceptual framework helps to express abstract ideas in a concise and readily understandable form. A schematic model represents phenomena graphically; concepts and linkages between them are represented through the use of boxes, arrows or other symbols; it is referred to as a conceptual map. Statistical models use symbols to express quantitatively the nature of relationships between variables (Burns & Grove 2011:179; Polit & Beck 2008:141).

In this study, an audit cycle was used as the conceptual framework. The steps of the audit cycle were followed to guide the researcher throughout the research.

1.9.1 The audit cycle of Morgan and Fennessy (1996)

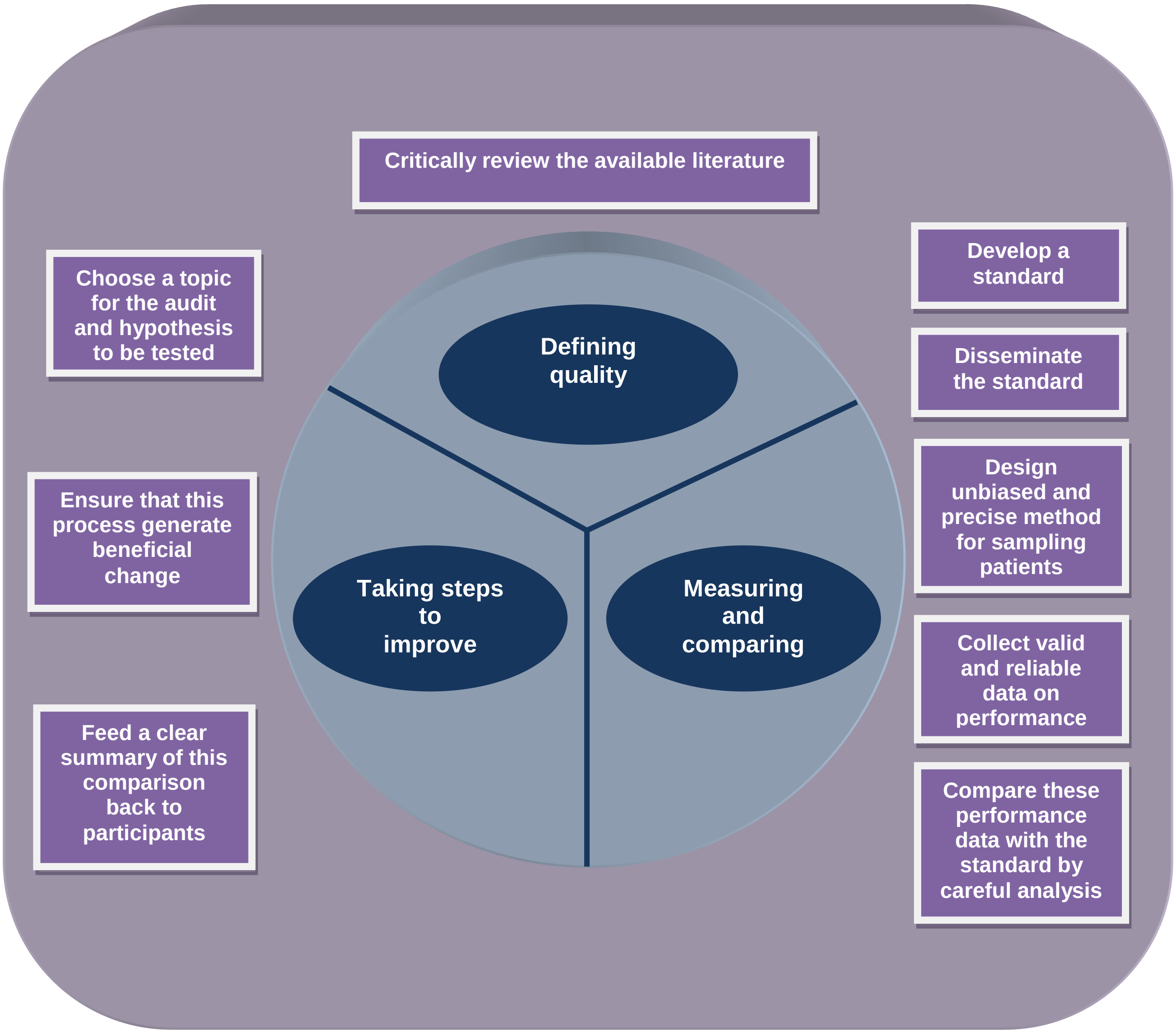

Figure 1.5 The audit cycle

(Adapted from Morgan & Fennessy (1996), in Pearson, Field and Jordan 2007:142)

The steps of the audit cycle offer a framework to establish clinical guidelines; assess current practice and implement changes and monitor the effects, providing a link in evidence-based practice. A clinical audit is a cyclic process, incorporating systematic steps to work through the cycle (Pearson et al 2007:140).

The following are the key stages in a clinical audit:

1.9.1.1 Defining quality

To define quality the following steps need to be followed: choosing a topic for the audit and hypothesis to be tested, critically reviewing the available literature, developing a standard and disseminating the standard (Pearson et al 2007:141).

- ***Choosing a topic***: Health practitioners, managers and patients should be involved in the selection of audit topics where significant improvements to the clinical care can be made. There should be feasible ways to make improvements or changes to the areas of care. Factors to be considered when prioritising topics are the issues of concern for stakeholders, variation in current practice, or an area of high risk, such as morbidity or mortality.

- ***Reviewing the literature***: The available literature should be reviewed to collect the necessary information on the topic of concern.

- ***Developing a standard*** – clinical guidelines and audit indicators should be set. The guidelines should be developed setting out what best practice is and how it is to be achieved.

- ***Disseminating the standard***: The standard should be distributed to all stakeholders. Sharing standards allows those who will be affected by them to give some input or feedback (Pearson et al 2007:144).

The quality of care is defined in relation to its effectiveness with regard to improve the patient's health status, and how well it meets professionals' and the public's standards about how the care should be provided (Bowling 2009:7).

The topic of interest in this study is the factors contributing to high neonatal death rates in a district hospital; this is an area of high risk, according to the researcher, as it concerns the morbidity and mortality of newborn babies within the first 28 days of life.

In this study, the researcher used the clinical standards developed by WHO (2007b:1) for maternal and newborn care, which are user friendly. The standards present the key recommendations on the delivery of maternal and neonatal care in health facilities, starting from the first level of care. The standards were developed due to the high maternal and neonatal mortality caused by inadequate and poor-quality health services associated with reduced utilisation of health care services (WHO 2007b:1).

1.9.1.2 Measuring and comparing

To measure and compare the standards, the following steps have to be undertaken: design unbiased and precise methods for sampling patients; collect valid and reliable data on performance; compare the performance data with the standard by careful analysis (Pearson et al 2007:141).

The audit indicators need to be assessed to decide how data will be collected to determine whether the standards have been met. The following criteria need to be met to achieve the standards:

- ***Structure criteria***: These are the resources, or what is needed to implement the standard.
- ***Process criteria***: This refers to what needs to be done to implement the standard, i.e. the actions to be taken and the decisions to be made.
- ***Outcome criteria***: These are anticipated results of the intervention, or what is expected to be achieved through implementing the care standard (Pearson et al 2007:144).

In this study, the process criteria were mainly used to collect data. Since the guidelines are specifically developed to suit the district hospital, clinics and health centres, the structure criteria were also considered. The researcher is interested in the outcome criteria of the factors contributing to neonatal mortality rates, considering the structure and process criteria.

1.9.1.3 Taking steps to improve

After data analysis, the reasons for the standards not being met are identified and a plan of improvement is developed. Some of the areas that may need to be addressed to achieve clinical effectiveness are education, when lack of knowledge was identified as a reason for poor practice; changing the system related to access to supplies, system of documentation, staff skills, and work load. These areas were identified as problem areas. Changing behaviour and measuring staff performance was identified as one of the reasons for failure to meet best practices. Re-auditing is necessary after the action plan has been implemented (Pearson et al 2007:146). Re-evaluation of practice through repeating the audit steps is a continuous process (Pearson et al 2007:141).

A variety of programmes have been developed to assist with the clinical audit process, for example the “Audit Maker”, developed by the Australian Centre for evidenced-based clinical practice to assist clinicians to set up a clinical audit database, and the Practical Application of Clinical Evidence System (PACES), an audit-based programme developed by the Joanna Briggs Institute (Pearson et al 2007:150).

In this study, recommendations were made after the auditing of the records of patients according to the findings of the research.

1.10 RESEARCH DESIGN AND METHODOLOGY

Babbie and Mouton (2007:74) define research design as a plan or blueprint of how a researcher intends to conduct the research. It is the overall approach to or an outline of the study that details all the major components of the research (Houser 2008:183).

This researcher used a quantitative, non-experimental, descriptive, exploratory and retrospective (ex-post facto) design in order to explore and describe the factors contributing to neonatal deaths (see chapter 3).

1.11 POPULATION

According to Polit and Beck (2008:337), a population is the entire aggregation of cases in which a researcher is interested, while Parahoo (2006:256) defines a population as the total number of units from which data can be potentially collected; these may be individuals, organisations, events or artifacts.

For this study, the population comprised all live births in the district hospital under study from January 2009 to December 2009.

1.12 SAMPLE AND SAMPLING

A *sample* is a set of elements that make up the population, as defined by LoBiondo-Wood and Haber (2006:263); according to Brink et al (2007:124) a sample is a part or fraction of a whole or a subset of a larger set selected by the researcher to participate in a research study. It consists of a selected group of elements of analysis from a defined population.

For this study, the sample comprised all newborn babies who died in the labour ward or were admitted in the neonatal unit from January 2009 to December 2009, with a gestational age of 28 weeks or more, and weighing 1000 g or more, and who died within a month or were discharged home alive within a month of delivery.

Sampling is a process of selecting representative units of a population for study in a research investigation. The purpose of sampling is to increase the efficiency of a research study; when done properly it enables the researcher to draw inferences and make generalisation about the population without examining each unit in the population (LoBiondo-Wood & Haber 2006:263). This is supported by Brink et al (2007:124), who refer to sampling as a process of selecting a sample from a population in order to obtain information regarding a phenomenon in a way that represents the population of interest.

In this study, sampling for the neonatal deaths was done through the census, and probability sampling using the systematic sampling technique was used for the control group. This will be discussed in detail in chapter 3.

1.13 DATA COLLECTION

According to Burns and Grove (2011:41), data collection is the process of gathering data relevant to the research purpose. The actual steps of collecting the data are specific to each study and are dependent on the research design and measurement methods. Data may be collected by observing, testing, measuring, questioning or recording, or any combination of these methods, and the researcher is actively involved in this process either by collecting data or supervising the data collectors.

According to Bowling (2009:8), an audit is directed at the maintenance and achievement of quality in health care. Audit aims to improve patient outcome, develop cost-effective use of resources; and have an educational function for health professionals. It should lead to change in clinical practice by encouraging reflective culture of reviewing current practice; and by inducting changes which may lead to better patient outcomes and satisfaction.

The following are the criteria for undertaking an audit:

- The issue addressed should be a common, significant or serious problem.
- Any changes following audit should be likely to benefit patients and to lead to greater effectiveness.
- The issue should be relevant to professional practice or development.
- There should be a realistic potential for improvement.
- The end result should justify the investment of the time and effort involved (Bowling 2009:8).

For the purposes of this study, an audit was conducted retrospectively, so the researcher collected data from delivery registers, the neonatal admission register, and maternal and neonatal records of babies who died in the labour unit and neonatal unit within 28 days of life from January 2009 to December 2009. In order to prevent bias, the researcher selected documents which met the inclusion criteria (refer to chapter 3).

The face validity of the audit tool was checked by colleagues who are experts in the field of obstetrics and neonatal care, while content validity was tested by asking for input by experts in obstetrics and neonatal care, such as advanced midwives, experienced midwives and the head of the obstetric unit.

1.14 DATA ANALYSIS

Data analysis is the systematic organisation and synthesis of research data and, in quantitative studies, the testing of hypotheses using those data (Polit & Beck 2008:751).

For the purpose of this study, the Statististical Analysis System of John's Macintosh Project (SAS JMP) computer program was used, with the assistance of a statistician to analyse the data, and descriptive statistics presented by modes, frequency and percentages were used to present the data.

Descriptive statistics allow the researcher to organise the data in ways that give meaning and facilitate insight, and to examine a phenomenon from a variety of angles. Descriptive statistics include frequency distributions, measures of central tendency, measure of dispersion and standardised scores (Burns & Grove 2011:537).

The researcher used descriptive statistics to provide answers to the research questions.

1.15 RELIABILITY AND VALIDITY

- **Validity**

Validity, as defined by Polit and Beck (2008:457), is the degree to which an instrument measures what it is supposed to measure. Content validity was used by the researcher to measure the degree to which the audit schedule appeared to measure the range of meanings included in the concept, by a logical analysis of the items as described by Babbie and Mouton (2007:122). This is supported by Burns and Grove (2011:365) who add that content-related validity is the extent to which the method of measurement includes all major elements relevant to the concepts being measured.

In this study, the audit tool was validated by requesting experts in the field, such as advanced midwives, experienced midwives, the manager of the obstetric unit and personnel with research experience to provide inputs on the audit schedule before it was used for data collection.

- **Reliability**

Wood and Ross-Kerr (2011:184) define reliability as the consistency, stability and repeatability of a data collection instrument which does not respond to chance factors or environmental conditions. It will produce consistent results if repeated over time on the same person, or if used by two different investigators. This is supported by Burns and Grove (2011:364), who agree that reliability is concerned with the consistency of the measurement technique. Internal consistency is the extent to which all parts of the measuring instrument measure the same concepts (Wood & Ross-Kerr 2011:188). The instrument had been adapted from the quality check of labour records. (See chapter 3 for further information.)

1.16 DEFINITION OF KEY TERMS

The following are the definitions of key terms as used in the study:

1.16.1 Avoidable factors

The term “avoidable” is defined in the *Oxford Concise English Dictionary* (1999:92; 508) as something that can be prevented from happening, and “factor” as an “influence that contributes to a result”.

According to Fraser, Cooper and Nolte (2006:1032), avoidable factors are acts or omissions by the patient, administration or healthcare worker which result in an adverse outcome for the mother and baby.

For the purposes of this study, “avoidable factors” shall mean acts or omissions during pregnancy, labour, delivery and neonatal care which contributed to the death of a neonate.

1.16.2 Midwife

A midwife is a person who, having been admitted to a midwifery educational programme, recognised in the country in which it is located, has successfully completed the prescribed course of studies in midwifery and has acquired the requisite qualifications to be registered and legally licensed to practice midwifery (Fraser et al 2006:5).

According to the Nursing Act No 33 of 2005, a midwife is a person who is qualified and competent to independently practise midwifery in the manner and on the level prescribed and who is capable of assuming responsibility and accountability for such practice (South Africa 2005:62).

For the purposes of this study “the midwife” shall mean a registered nurse with midwifery qualifications registered with the South African Nursing Council and who is working in a selected hospital in the Mpumalanga province.

1.16.3 Intrapartum care

“Intrapartum” is defined by Tiran (1997:141), as the time between the onset of the first stage of labour and completion of the third stage of labour, while the *Oxford Concise English Dictionary* (1999:212) defines care as the provision of what is necessary for the health, welfare, maintenance and protection of someone or something.

London, Ladewig, Ball, Bindler and Cowen (2011:200) define intrapartum care as care from the onset of true labour until the birth of the infant and placenta.

For the purpose of this study, intrapartum care refers to caring, during all stages of the labour process, for a patient who has been admitted to a selected Level I hospital in the Mpumlalanga province.

1.16.4 Neonate

A neonate is a newborn infant from birth to 28 days after birth (Leifer 2007:347).

For the purposes of this study, a neonate refers to a live newborn infant who has been born in a selected Level I hospital in the Mpumalanga province.

1.16.5 Small for gestational age infant (SGA)

According to the *Oxford Concise English Dictionary* (1999:1354), “small” is of a size that is less than normal or usual, and Tiran (1997:108) defines “gestation” as pregnancy, while “age” is defined in the *Oxford Concise English Dictionary* (1999:24) as the length of time that a person has existed.

A small for gestational age infant is an infant with a weight below the 10^{th} percentile for gestational age, as defined by Harrison (2008:6).

For the purposes of this study, a small for gestational age infant refers to a live newborn infant with a weight of below the 10^{th} percentile who has been born in a selected Level I hospital in the Mpumalanga province.

1.16.6 Low birth-weight infant (LBW)

A low birth-weight infant is an infant weighing less than 2500 g or 2.5 kilograms (kg) at birth, regardless of gestational age (Perry, Hockenberry, Lowdermilk & Wilson 2010:707).

For the purposes of this study, a low birth-weight infant refers to a live newborn infant with a weight of less than 2.5 kg who has been born in a selected Level I hospital in the Mpumalanga province.

1.16.7 Preterm/Premature infant

A preterm or premature infant is an infant born before the end of 37 completed weeks of gestation (London et al 2011:673).

For the purposes of this study, a preterm infant refers to a live newborn infant who is born with a gestational age of less than 37 weeks in a selected Level I hospital in the Mpumalanga province.

1.16.8 Kangaroo mother care (KMC)

"Kangaroo mother care" involves placing a nappy-clad baby upright between the maternal breasts for skin-skin contact to promote closeness between a baby and the mother (Fraser et al 2006:774).

For the purposes of this study, kangaroo mother care refers to care given to a preterm infant, low birth-weight infant and one small for gestational age through skin-to-skin contact between the mother and the baby in a selected Level I hospital in the Mpumalanga province.

1.16.9 Perinatal period

The perinatal period is the time from the beginning of foetal viability until the end of the sixth day after birth (Perry et al 2010:36).

For the purposes of this study, the perinatal period refers to the gestational age of 28 weeks until the sixth day after birth of a live newborn infant in a selected Level I hospital in the Mpumalanga province.

1.16.10 Perinatal mortality rate (PNMR)

The perinatal mortality rate is the number of perinatal deaths per total number of deliveries, expressed per 1000 deliveries (Perry et al 2010:707). For the purposes of this study, the perinatal mortality rate refers to the number of stillbirths and neonatal deaths with a gestational age of 28 weeks and more, calculated per 1000 deliveries, in a selected Level I hospital in the Mpumalanga province.

1.16.11 Neonatal death (NND)

Neonatal death is death of an infant within 28 days of birth. It is subdivided into early neonatal death (ENND), which is the death of an infant within the first week of birth, and late neonatal death (LNND), which is death of an infant between 8 days and 28 days of birth (Harrison 2008:2).

For the purposes of this study, neonatal death shall mean the death of a live born infant within 28 days of birth who died in the labour unit or neonatal unit in a selected Level I hospital in the Mpumalanga province before discharge.

1.16.12 Neonatal death rate (NNDR)/Neonatal mortality rate (NMR)

Neonatal death rate is the total number of neonatal deaths per 1000 live births (Harrison 2008:2).

For the purposes of this study the terms will be used interchangeably and shall mean the total number of neonatal deaths of infants with a gestational age of 28 weeks or birth mass of 1000 g or more per 1000 live births in a selected Level I hospital in the Mpumalanga province.

1.16.13 Perinatal education programme (PEP)

A perinatal education programme is a programme developed by nurses, obstetricians and paediatricians to provide continuous education and training to all staff, i.e. medical and nursing staff, to improve and update their theoretical knowledge and practical skills (Woods 2009:9).

For the purposes of this study, a perinatal education programme refers to training of midwives, enrolled nurses and enrolled nurse auxiliaries in the care of newborn infants in a selected Level I hospital in the Mpumalanga province.

1.16.14 Millennium development goals (MDGs)

Millennium development goals are health goals and objectives adopted by all members of the United Nations, to be implemented by 2015 (Kibel et al 2007:527).

For the purposes of this study, millennium development goals refer to the MDGs 4,5 and 6 relating to reduction of maternal deaths and neonatal deaths, as well as promotion of maternal and neonatal health in a selected Level I hospital in the Mpumalanga province.

1.17 SCOPE OF THE STUDY

The study was limited to one Level I hospital. Only records of neonates who were delivered in the hospital and those who were admitted from home and died within 28 days after birth were assessed from January to December 2009. Neonates who died at home were excluded from the study.

1.18 LIMITATIONS OF THE STUDY

The results of the study cannot be generalised to other district hospitals because it was representative of the population of one specific Level I hospital. Neonatal deaths in one Level I hospital were assessed. The results may not be reliable because some documentation in the records was incomplete; however, the researcher took all possible care to select those records with the most complete information.

1.19 ETHICAL CONSIDERATIONS

Houser (2008:53) defines ethics as “the study of right and wrong” and Tappen (2011:173) defines research ethics as “norms for conduct that distinguish between acceptable and unacceptable behaviour” when doing research. Ethical considerations in the conduct of research were followed to prevent ethical dilemmas. To ensure the ethical conduct of the study, permission to conduct the study was sought from the Research and Ethics Committee at Unisa (Department of Health Studies), the Research and Ethics Committee in Mpumalanga province, and the hospital management and the supervisor of the maternity unit at the Level 1 hospital under study.

Furthermore, the following ethical principles were adhered to in the study:

- The principle of beneficence
- The principle of respect for human dignity
- The principle of justice (Polit & Beck 2008:170)

(See chapter 3 for further information.)

1.20 OUTLINE OF THE STUDY

This chapter introduced the study, gave a background to the research problem, and described the problem statement, purpose, objectives, and significance of the study, definition of key terms, research methodology, ethical considerations, and the reliability and validity of the study.

Chapter 2 discusses the literature review undertaken for the study.

Chapter 3 describes the research design and methodology.

Chapter 4 presents the results of the study.

Chapter 5 concludes the study, presents conclusions and makes recommendations.

1.21 CONCLUSION

This chapter explained the background to the problem, presented the problem statement, the purpose of the study, research objectives and significance of the study, defined key words, and briefly discussed the methodology and ethical considerations.

Chapter 2 will discuss the literature review.

CHAPTER 2

Literature review

2.1 INTRODUCTION

This chapter discusses the literature review undertaken for the study. According to Polit and Beck (2008:69), the literature review helps to lay the foundation for a study and inspire new research ideas. LoBiondo-Wood and Haber (2006:79) state that the purpose of the literature review is to develop a strong knowledge base for the conduct of research and evidence-based practice. Burns and Grove (2011:37) state that a literature review is conducted to generate a picture of what is known and not known about a particular problem.

The purpose of the literature review in this study was to obtain information on the

- audit cycle and its stages
- WHO standards for maternal and neonatal care
- South African maternity guidelines
- causes of neonatal deaths
- avoidable factors in neonatal deaths
- evidence-based practice in reduction of neonatal deaths
- legislative framework of perinatal care services globally and in South Africa

An audit cycle is used as the conceptual framework to guide the study.

2.2 AUDIT CYCLE OF MORGAN AND FENNESSY

According to Bowling (2009:8), an audit is directed at the maintenance and achievement of quality in health care. Pearson et al (2007:139) state that a clinical audit is an instrument that addresses all the components of clinical effectiveness in the ongoing goal of improving the quality of health care. It is a process used by health care professionals to examine their care practices and compare the results with clinical guidelines or best-practice statements. The following are the stages of the audit cycle:

2.2.1 Stage one: Defining quality

Stage one of the audit cycle defines best practice, which include actions in which the topic is chosen, standards are developed and dissemination of standards to all stakeholders is ensured.

- *Choosing a topic*. Health practitioners, managers and patients should be involved in the selection of audit topics where significant improvements to the clinical care can be made. There should be feasible ways to make improvements or changes to the areas of care. Factors to be considered when prioritising topics are the issues of concern to stakeholders, variations in current practice, and areas of high risk, such as morbidity and mortality.
- *Developing a standard – clinical guidelines and audit indicators*. The guidelines should be developed by setting out what best practice is and how it is to be achieved.
- *Disseminating the standard*. The standard should be distributed to all stakeholders. Sharing the standards allows those who will be affected by them to give some input or feedback (Pearson et al 2007:144).

The topic of interest in this study is the factors which contribute to the high rate of neonatal deaths in a district hospital, which is an area of high risk, according to the researcher, as it concerns the morbidity and mortality of newborn babies within 28 days of life.

The WHO (2007b:1) developed clinical standards for maternal and newborn care which are user friendly. The standards present the key recommendations on the delivery of maternal and neonatal care in health facilities, starting from the first level of care. The standards were developed because of the high maternal and neonatal mortality caused by inadequate and poor-quality health services associated with reduced utilisation of health care services (WHO 2007b:1).

The following are the WHO standards for maternal and neonatal care (WHO 2007b:1):

- All women giving birth and their newborn babies should be protected against tetanus to prevent maternal and neonatal tetanus.
- All women seen during pregnancy, childbirth and in the postnatal period should be given appropriate information on the prevention and recognition of sexually transmitted infections and reproductive tract infections. They should be assessed for sexually transmitted infections and reproductive tract infections and, when required, provided with prompt and effective treatment for themselves and, in the case of sexually transmitted infections, their partners, to reduce maternal and perinatal morbidity and mortality and infertility caused by sexually transmitted infections and reproductive tract infections (WHO 2007b:2).
- All pregnant women should be screened for syphilis at the first antenatal visit, within the first trimester and again in late pregnancy. At delivery, women who for some reason do not have test results should be tested/retested. Women testing positive should be treated and informed of the importance of being tested for HIV infection. Their partners should also be treated and plans should be made to treat their infant at birth to reduce maternal morbidity, foetal loss and neonatal mortality and morbidity due to syphilis (WHO 2007b:3).
- All women, from the moment they begin trying to conceive until 12 weeks gestation, should take a folic acid supplement. Women who have had a foetus diagnosed as affected by a neural tube defect, or who have given birth to a baby with neural tube defect, should receive information on the risk of recurrence, be advised on the protective effect of periconceptional folate supplementation and be offered high-dose supplementation to prevent neural tube defect and other congenital malformations in the foetus (WHO 2007b:5).
- All pregnant women should have at least four antenatal care assessments by or under supervision of a skilled attendant. These should, as a minimum, include all the interventions outlined in the new WHO antenatal care model and be spaced at regular intervals throughout pregnancy, commencing as early as possible in the first trimester to prevent, alleviate or treat/manage health problems/disease (including those directly related to pregnancy) that are known to have an unfavourable outcome on pregnancy, and to provide women and their families/partners with appropriate information and advice for a healthy pregnancy, childbirth and postnatal recovery, including care of the newborn,

promotion of early exclusive breastfeeding and assistance with deciding on future pregnancies in order to improve pregnancy outcomes (WHO 2007b:6).

- In high malaria-risk areas, all pregnant women should sleep under an insecticide-treated bed net, and in areas of stable transmission of *falciparum malaria* all pregnant women should be given intermittent preventive treatment. Pregnant women suspected of having malaria should be assessed and treated in accordance with national protocols. In the postnatal period, both the mother and the baby should sleep under an insecticide-treated bed net to reduce the incidence of negative outcomes in women and their babies due to malaria during pregnancy (WHO 2007b:7).
- All pregnant women in areas of high prevalence of malnutrition should routinely receive iron and folate supplements, together with appropriate dietary advice, to prevent anaemia. Where the prevalence of anaemia in pregnant women is high (40% or more), supplementation should continue for three months in the postpartum period to prevent and treat iron-deficiency anaemia in women during pregnancy and in the postpartum period, in order to improve maternal and perinatal health (WHO 2007b:8).
- All pregnant women should have a written plan for birth and for dealing with unexpected adverse events, such as complications or emergencies, that may occur during pregnancy, childbirth or the immediate postnatal period, and should discuss and review this plan with a skilled attendant at each antenatal assessment and at least one month prior to the expected date of birth, to assist women and their partners and families to be adequately prepared for childbirth by making plans on how to respond if complications or unexpected adverse events occur to the woman and/or the baby at any time during pregnancy, childbirth or early postnatal period (WHO 2007b:9).

In South Africa, these standards are compiled as maternity guidelines and are distributed to the provinces, districts and all health facilities caring for pregnant women and their babies. Hereunder are the guidelines which have been set by the DoH.

- All women attending antenatal care should be given routine information about voluntary HIV testing and the prevention of mother-to-child transmission. The initial information on HIV and its transmission should be given in a 'group information session', and thereafter all women who have not previously been tested or those who require repeat testing should have an 'individual information session' and informed about voluntary HIV testing. Women who refuse to have an HIV test should be offered routine voluntary HIV testing on every subsequent clinic visit. All women who test HIV positive on the screening rapid test should have their status confirmed using a second rapid finger-prick test with a different kit. A national coding system should be used in all women who have been offered voluntary counselling and testing. (DoH 2007:133).

- All pregnant women should be provided with essential information in the form of written or illustrated cards or pamphlets. The information given should include danger signs and symptoms of pregnancy, self care in pregnancy, delivery plan and newborn and infant care as well as future pregnancies and contraception (DoH 2007:27).
- A thorough history should be collected on the first antenatal visit relating to previous pregnancies and their problems, medical conditions, genetic disorders, allergies, use of medications, use of alcohol and smoking, and family and social circumstances, including cultural and religious beliefs.

2.2.2 Stage two: Measuring and comparing

The audit indicators need to be assessed to decide how data will be collected to determine whether the standards have been met. The following criteria need to be met to achieve the standards:

- ***Structure criteria***. These are the resources, or what is needed to implement the standard.
- ***Process criteria***. This refers to what needs to be done to implement the standard, i.e. the actions to take and the decisions to make.
- ***Outcome criteria***. These are anticipated results of the intervention, or what is expected to be achieved through implementing the care standard (Pearson et al 2007:144).

In this study, the process criteria were mainly used to collect data. Since the guidelines are specifically developed to suit the district hospital, clinics and health centres, the structure criteria were also considered. The study is interested in the outcome criteria of the factors contributing to neonatal deaths, considering the structure and process criteria.

The guidelines, according to DoH (2007:18), include guidelines on:

- Antenatal care
- Intrapartum care
- Immediate care of newborn baby

2.2.2.1 Antenatal care

Fraser et al (2006:231) define antenatal or antepartum care as care given to pregnant woman from the time of conception until the onset of labour.

According to the DoH (2007:19), antenatal care attempts to ensure by antenatal preparation the best possible pregnancy outcome for women and their babies, by screening for pregnancy problems, assessing pregnancy risks, treating problems that may arise during the antenatal period, giving medications that may improve the pregnancy outcome, providing information to pregnant women and preparing them physically and psychologically for childbirth and parenthood.

The following are the clinical standards for antenatal care according to the Department of Health in South Africa:

The first antenatal visit

The first antenatal visit is the most crucial visit, in which the baseline data and all relevant history details are taken and investigations done.

- **Confirmation of pregnancy and timing of the first visit**

Women should visit the health care provider as soon as they suspect pregnancy, even as early as the first missed menstrual period. A urine test must be done to confirm pregnancy. Women who present to primary care clinics and are found to be pregnant must be issued with an antenatal card and receive first-visit antenatal care.

Complete assessment of gestational age and risk factors can be made at the first antenatal visit (DoH 2007:20).

- o **History taking**

A full and relevant history is taken regarding current pregnancy, previous pregnancies and their complications and outcomes, medical conditions, including psychiatric problems and previous operations, familial and genetic disorders, allergies, use of medications, use of alcohol, tobacco and other substances, family and social circumstances, cultural aspects and medical problems, such as HIV/AIDS (DoH 2007:20).

- o **Physical examination**

The general appearance of the woman is assessed as it points to good or poor health.

- General examination is done, including weight, height, and heart rate, colour of mucous membranes, blood pressure, oedema, and palpation for lymph nodes.
- A systemic examination of teeth, breasts, thyroid, and heart and lung examination is done. If no staff member in the antenatal clinic is trained to perform heart and lung examination, this may be omitted provided the pregnant woman has no history or symptoms of heart or lung disease. Women with dental problems must be referred to a dentist or dental therapist.
- Examination of the pregnancy is done, including inspection of the pregnant uterus, with measurement of the symphysis fundal height (SFH) in centimetres (cm). Listen to the foetal heart from 26 weeks gestation (DoH 2007:20).

- o **Estimation of gestational age**

The gestational age and how it was estimated should be indicated on the antenatal card. The first estimation of gestational age, with the expected date of delivery, should be used for the remainder of the pregnancy and must not be changed unless important new information becomes available (DoH 2007:22).

- **Last menstrual period**

This is valid if the woman is sure of her dates, and where palpation of the uterus and SFH measurement are compatible with the given date calculated from the first day of the last menstrual period (DoH 2007:23).

- **Symphysis-fundal height measurement**

This is used for estimation of gestational age after 24 weeks if the dates from the last menstrual period are unknown or wrong, in the presence of a normal singleton pregnancy. The measured SFH is plotted onto the 50^{th} centile line on the symphysis fundal height graph, allowing the corresponding gestational age to be read from the graph (DoH 2007:23).

- **Palpation**

In early pregnancy, bimanual and abdominal palpation can be used (DoH 2007:23).

- **Ultrasound**

An ultrasound scan for gestational age estimation should be requested for women who are unsure of the date, with SFH measurement less than 24 cm, to give reasonably accurate gestational age estimates before 24 weeks of gestation. After 24 weeks this test is less reliable (DoH 2007:23).

- **Essential screening investigations**

Investigations which should be done during the first antenatal visit are syphilis serology, i.e. Rapid plasma regain (RPR) or Venereal disease research laboratory (VDRL); Rhesus (D) blood group, haemoglobin (Hb) level, HIV serology and urine dipstick testing for protein and glucose (DoH 2007:26).

- **Medications and vaccines**

The medications that are given to all pregnant women are ferrous sulphate tablets 200mg daily, to prevent anaemia, calcium tablets 1000 milligram (mg) daily, to prevent complications of pre-eclampsia, and folic acid tablets 5mg daily to prevent neural tube defects (DoH 2007:26).

Tetanus toxoid immunisation, to prevent neonatal tetanus, should routinely be given to all pregnant women as follows:

- First pregnancy: Tetanus toxoid first dosage at first antenatal visit, then second dose at four weeks, then third dose six months later.
- Later pregnancies: Two tetanus toxoid boosters, one in each pregnancy at the first visit, for two subsequent pregnancies, at least one year apart.
- A total of five properly spaced doses of tetanus toxoid provide lifelong protection against tetanus.
- If in a subsequent pregnancy there is no record of previous immunisation, treat as for a first pregnancy (DoH 2007:26).

- **Final assessment**

In the final assessment the risk factors are checked and planned for further antenatal care and delivery, the best estimate of gestational age based on the evidence is obtained from the date of the last menstrual period, foetal palpation, measurement of SFH and ultrasound if available and a plan for management of any problems is made (DoH 2007:26).

- **Information for pregnant women**

The following information must be provided to all pregnant women, verbally and in the form of written or illustrated cards or pamphlets.

The five danger signs and symptoms of pregnancy that need to be observed, which are severe headache, abdominal pain, drainage of liquor from vagina, vaginal bleeding and reduced foetal movements. Any experience of these symptoms should be reported immediately to the clinic or hospital with her antenatal card (DoH 2007:27).

Self-care in pregnancy, which includes diet and exercise, personal hygiene and breast care, care in use of medications and avoidance of abuse of alcohol, tobacco and recreational drugs (DoH 2007:27).

A provisional delivery plan, which should be given at the end of the first visit to all pregnant women, i.e. the expected date of delivery based on the best estimate of gestational age; place of delivery, whether community health centres or hospital; mode of delivery, whether vaginal or caesarean section; who will deliver the baby, whether midwife or doctor; pain relief options including non-pharmacological methods; a transport plan for emergency or delivery, including important contact numbers and preparation for possible home delivery (DoH 2007:27).

Newborn and infant care, i.e. plans for infant feeding and techniques, whether breast or formula, and details of follow-up care including immunisation and where this can be obtained (DoH 2007:27).

Discussion of future pregnancies and contraception, which includes information on genetic disorders and birth defects and the contraceptive method that will be used after the pregnancy should be conducted with all pregnant women (DoH 2007:28).

Subsequent antenatal visits

o **Schedule for return visits**

- A ‘basic antenatal care’ schedule of four follow-ups is provided for women without risk factors.
- Following an early booking visit (<12 weeks), return visits should be scheduled for 20, 26, 32 and 38 weeks, and at 41 weeks if still pregnant.
- Return visits schedules for women with risk factors depend on their specific problems (DoH 2007:28).

- **Content of subsequent antenatal visits**

The management of subsequent visits is almost the same as the first antenatal visit, with some differences. A summary of basic antenatal care is checked, the woman is asked about her general well-being, foetal movements, danger symptoms and any other problems. The blood pressure, heart rate and colour of the mucous membranes are checked. The symphysis fundal height is measured in centimetres and plotted on the graph against the gestational age and compared with 10^{th}, 50^{th} and 90^{th} centiles for gestational age and previous measurements. Palpation is done to exclude breech presentation at 38 weeks.

The urine is tested for protein, glucose, blood and ketones. The HIV test is repeated at 32 weeks for all women who tested negative at initial testing. The blood test for haemoglobin is repeated at 32 weeks and 38 weeks, and Rapid plasma regain is also repeated at ± 36 weeks if the first test was negative before 20 weeks pregnancy.

The information for danger signs of pregnancy is repeated, delivery and transport plans are reviewed, as well as feeding and contraceptive choices at 32 and 38 weeks. At 38 weeks, the woman is reminded to bring her antenatal card when she presents to the clinic or hospital in labour (DoH 2007:28).

Information should be recorded and checked against the information from the previous visits and treatment initiated. Evaluation of previous problems should be done to assess the success or failure of the treatment given.

- **Foetal movement counting**

Foetal movement counting is indicated for high-risk pregnancies, for example in women with pre-eclampsia, diabetes mellitus, intrauterine growth impairment, or previous unexplained stillbirth. The mother should be asked to count foetal movements for one hour at the same time every day, after breakfast. The number of movements should be recorded on a foetal movement chart. If there are four or more movements in one hour, the count is repeated at the same time on the next day. If there are less than four movements in one hour, or less than half of the hourly average (about a week of counting), the mother should count foetal movements for one more hour. If there are still less than four movements or less than half of the hourly average, cardiotocograph is indicated to assess foetal well-being. Delivery may be considered depending on the clinical situation (DoH 2007:31).

Risk factors requiring referral or hospital delivery

Risk factors are any findings that have been shown to have a negative effect on pregnancy outcome (London et al 2011:326). Risk factors may be assessed from the obstetric history, current history and general medical conditions. Some of the risk factors may arise during the antenatal period. These risk factors need to be identified and managed or referred appropriately.

- **Obstetric history**

Previous obstetric history gives the examiner an idea of which risk factors to look for during the examination so that their recurrence can, if possible, be prevented; for example previous stillbirth, neonatal death, low birth-weight baby (<2.5 kg), large baby (>4.5 kg), pregnancy admission for hypertension or pre-eclampsia, caesarean section, myomectomy, cone biopsy and cervical cerclage (DoH 2007:30).

- **Current history**

With the current history, observations and complaints of the client are able to be related to the examination at hand and risk factors identified that put the mother and the foetus in danger. These risk factors assist in choosing the most appropriate management during pregnancy and deciding on the mode of delivery for the foetus, for example diagnosed or suspected multiple pregnancy, age <16 years, age >34 years, Rhesus isoimmunisation in previous or current pregnancy, vaginal bleeding, pelvic mass and diastolic blood pressure of ≥90 millimetres of mercury (mmHg) (DoH 2007:30).

- **General medical conditions**

Pregnancy is biologically, physiologically and psychologically stressful even for healthy women. In women with pre-existing conditions, it may be life-threatening. It is important to identify early interventions to diminish the adverse effects of pregnancy on both the mother and baby (London et al 2011:432). Medical conditions to be considered are diabetes mellitus, cardiac disease, kidney disease, epilepsy, asthma on medication, active tuberculosis, known ‘substance’ abuse including alcohol, and any severe medical condition (DoH 2007:30).

- **Risk factors requiring hospital delivery**

The aim of antenatal care is to monitor the progress of pregnancy to optimize maternal and foetal health. It is aimed at identification, assessment and management of women whose pregnancies are at risk due to potential existing complications (Fraser et al 2006:233). Cases with previous postpartum haemorrhage and parity of ≥5 have to be considered for hospital delivery (DoH 2007:31)

- **Risk factors arising during antenatal care**

Pregnancy is usually normal and uncomplicated. In some cases problems may arise during pregnancy that places the woman and the foetus at risk. Regular prenatal care serves to detect those potential problems quickly so that effective care can be provided (London et al 2011:468). Risk factors like anaemia not responding to iron tablets, a uterus large for her dates (>90th centile SFH), a uterus small for her dates (<10thcentile SFH), SFH decreasing, breech or transverse lie at term, extensive vulval warts that may obstruct vaginal delivery, pregnancy beyond 41 weeks, abnormal glucose screening (Glucose Tolerance Test or random blood sugar) and reduced foetal movements from 28 weeks need to be referred to the doctor (DoH 2007:20).

2.2.2.2 Intrapartum care

London et al (2011:200), define intrapartum care as the care given to pregnant women from the onset of labour until the birth of the infant and placenta. According to the DoH (2007:34), the following are the guidelines for the care of the woman in labour.

Labour is diagnosed if there are persistent painful contractions accompanied by either cervical effacement or dilatation, and rupture of the membranes or show, which is a bloodstained or mucoid vaginal discharge.

Admission of a woman in labour

The physiological events occurring during labour result in adaptations by the mother and foetus to the changed conditions. This calls for accurate and frequent assessment of the woman and foetus to check how they are adapting to the stresses of labour (London et al 2011:584).

- **History taking**

History on admission is imperative, as it assists in identification of high-risk factors which can have detrimental effects on the mother and the foetus before and during labour. The antenatal card should be carefully reviewed and risk factors noted. Unbooked mothers should be interviewed as if they were attending antenatal care for the first time. The HIV status is assessed by decoding, using the national coding system. If the HIV status is not noted or cannot be decoded, ask confidentially if the HIV test was done and the result. The nature of labour pains, vaginal bleeding, foetal movements, passage of liquor and any other relevant symptoms are noted (DoH 2007:34).

- **Physical examination**

On admission, a full general abdominal and vaginal examination must be performed. This assessment provides the baseline data against which future observations and assessments can be made as labour progresses.

The psychological state, heart rate, temperature, blood pressure and oedema or pallor is noted. The abdomen is examined by inspecting the abdomen for any abnormalities, e.g. previous caesarean section scars, foetal movements, size and shape, measuring the SFH in centimetres, assessing the lie, presentation, position and attitude, the level of the presenting part in fifths above the pelvic brim, liquor volume, uterine tone, and strength and frequency of contractions. Auscultation of the foetal heart rate between, during and after contractions is done, and estimation of foetal weight.

A vaginal examination is performed and the vulva and vagina assessed for any abnormal discharge, warts and ulcers. The cervix is assessed for length (effacement), position, consistency and dilatation in centimetres. The membranes are assessed, whether ruptured or not, and whether there is meconium staining. The presenting part is assessed for position, degree of moulding and caput (DoH 2007:34).

- o **Special investigations**

Antenatal investigations should be evaluated, and if not done the tests need to be done on admission. The urine is tested for glucose, protein and ketones, blood collected for RPR and Rhesus group in unbooked women and in those whose results are not available, and for haemoglobin if there are no recent results of less than 6 weeks old. Ensure that all results are available and written into the records prior to the women leaving the facility. Offer routine counselling and voluntary testing for HIV if no results are available (DoH 2007:35).

- o **Partogram**

A Partogram is an effective measure of recording the progress of labour graphically, as stated by Fraser et al (2006:456). All observations, fluid intake and output, and medications are entered on the Partogram to assess the progress of labour and condition of mother and foetus (DoH 207:36).

Routine monitoring of the first stage of labour

During the first stage of labour, the effects of uterine contractions on the course of labour and the wellbeing of the foetus are assessed. The vital signs, contractions pattern, cervical changes and intake and output, which give a picture of the maternal condition, are also assessed (London et al 2011:632).

(i) Latent phase

The latent phase is when the woman is in labour and the cervix is less than three to four cm dilated and more than one cm long. During this phase the blood pressure, pulse rate and temperature are checked four-hourly, uterine contractions and foetal heart rate are assessed two-hourly and vaginal examinations done four-hourly. Any change in condition warrants more frequent observation (DoH 2007:36).

(ii) Active phase

The active phase is when the woman is in labour and the cervix is more than 3–4 cm dilated and less than one centimetre long (DoH 2007:36).

- *Maternal condition*

During the active phase of labour, the maternal condition is assessed, as her psychological and physical wellbeing are essential for the normal progress of labour. Blood pressure and heart rate are checked hourly. Temperature is checked four-hourly and urine volume and testing are done two-hourly (DoH 2007:36).

- *Foetal condition*

Foetal monitoring is important during labour to identify the foetal response to labour. During the active phase the foetal heart rate is assessed half-hourly – before, during and after contractions. The colour and odour of the liquor is assessed two-hourly if the membranes have ruptured (DoH 2007:36).

- *Progress of labour*

The Partogram is used to record and assess the progress of labour. Any deviations from the norm can easily be identified on the Partogram. The following should be recorded on the Partogram: frequency and strength of uterine contractions, which are checked hourly, level of the presenting part, cervical dilatation, caput and parieto-parietal moulding and condition of membranes, which are assessed two-hourly (DoH 2007:36).

- *Treatment given*

Medications and intravenous solutions given to the woman for anything should always be recorded. All medications and fluids administered, by whatever route, should be recorded (DoH 2007:36).

- *Summary of findings*

After all the assessments and evaluations, a short summary of identified problems and proposed management should be given (DoH 2007:36).

- *Analgesia in labour*

The degree of pain varies in different women, and also at different stages of labour. It is important that this be considered and all women in labour be given pain relief (DoH 2007:37).

Management of the second stage of labour

The second stage commences when the cervix reaches full dilatation (10 cm), up to two hours before the mother starts to bear down. The head should be allowed to descend onto the pelvic floor if foetal distress and cephalopelvic disproportion have been ruled out. The bladder should be emptied. Observations of the first stage of labour should continue. Bearing down should only be encouraged when the foetal head starts to distend the perineum and the mother has an urge to push (DoH 2007:40).

- **Episiotomy**

Episiotomy should only be performed for a valid indication. In cases where there is a thick or rigid perineum, foetal distress in the second stage of labour, prolonged second stage of labour with the foetal head bulging the perineum, maternal conditions where rapid delivery is required, such as cardiac disease, breech or assisted delivery, previous third-degree tear and delivery of preterm babies where the perineum is tight (DoH 2007:40).

Immediate care of the baby

All newborn babies should be assigned an Apgar score within one and five minutes of delivery in order to identify whether the baby may need resuscitation or not (DoH 2007:57).

Apgar score is the clinical assessment of the baby's condition after birth devised by Virginia Apgar. It consists of five physical signs, i.e. heart rate, respiratory effort, muscle tone, response to stimuli and colour, each scoring 0, 1 and 2 points. The total score indicates the clinical condition of the baby and the need for resuscitation. The assessment is done at one and five minutes after delivery.

The Apgar of 7-10 indicate normal baby, 4-6 indicate mild to moderate and 0-3 severe respiratory depression (Harrison 2008:168).

- **Neonatal resuscitation**

All staff who conducts deliveries should be able to resuscitate and provide immediate care to newborn infants (DoH 2007:57).

- **Babies who may require resuscitation**

A skilled doctor or midwife should always be present during the delivery of high-risk babies, as they are more likely to have birth asphyxia and will probably need to be resuscitated. Babies who have meconium staining of amniotic fluid or any other evidence of foetal distress during labour, prematurity (<36 weeks), postmaturity (>42 weeks), anticipated small babies (<2000 g), anticipated large babies (>4000 g), multiple pregnancy, known major congenital abnormalities of hydrops, cord prolapse, *abruptio placentae*, prolonged or difficult labour and malpresentation are more at risk of having birth asphyxia and needing to be resuscitated (DoH 2007:57).

- **Immediate care of the well baby**

If the baby does not need resuscitation, dry the baby, remove wet linen and provide warmth. Clear the airway if there are secretions and maintain warmth by nursing the baby in kangaroo mother care. Start feeds within an hour after birth, breastfeed unless contraindicated. Do physical examination to look for congenital abnormalities and take measurements (weight, length and head circumference). Do cord care; apply prophylactic eye ointment within an hour after birth and give vitamin K within one hour after birth (DoH 2007:58).

2.2.2.3 Care of sick or small infants

For every baby, whether brought to the health care facility from home, transferred from another institution or ward, or from the labour room due to a complicated birth, the management care involves planning, implementing and evaluating care based on the ongoing assessment of the baby's condition (WHO 2003:F-1).

The following are the standards to be followed, according to WHO (2003:F-5), Department of Reproductive Health and Research:

Rapid assessment and immediate management

All babies should be assessed immediately on arrival, whether they are from home, another health facility, another ward or from the delivery room. Their care is based on assessment, planning, implementing and evaluating the baby's condition.

- o **Rapid assessment**

The baby is examined immediately for the emergency signs: not breathing even when stimulated; gasping; of a respiratory rate less than 20 breaths per minute, bleeding or shock characterised by pallor, cold to touch, heart rate more than 180 beats per minute, and an extremely lethargic or unconscious baby (WHO 2003:F-5).

- o **Immediate management**

Immediate management is provided for life-threatening emergency signs by ensuring warmth, resuscitating the baby and giving oxygen, stopping visible bleeding and giving vitamin K while taking a blood sample for typing and cross-matching. Establish an intravenous line and infuse normal saline or Ringer's Lactate 10 millilitres/kilogram (ml/kg) and weigh the baby (WHO 2003:F-5).

Further assessment and management

After examining for emergency signs and providing immediate management, the assessment of the baby is continued. The history of the baby and the mother is obtained. The baby is examined completely. The findings from the history and examination are used to choose the most appropriate management for the baby. Additional examinations are completed and the required laboratory investigations are determined. Appropriate laboratory investigations are performed and the baby treated. All information is recorded including the findings of the history, examination and laboratory investigations, treatment given, changes in the baby's condition and arrangement for transfer and referral if necessary (WHO 2003:F-7).

Ongoing care

A general plan of care should be developed that takes into account the special needs of the baby. Monitor the baby's progress and recovery by performing ongoing general assessment. The respiratory rate, heart rate, colour, temperature, weight, rate and volume of intravenous fluid and frequency and volume of feeds are monitored.

The plan of care should be changed according to changes in the baby's condition. Provide emotional support to the mother and other family members (WHO 2003:F-3).

Documenting the care

All interventions carried out on the baby, including the assessment and planning of the baby's care, need to be documented for continuity of care, report giving and further evaluation. Record the necessary treatment in a written plan of care and communicate the plan to the medical team and other staff involved in the care of the baby. Document any changes in the baby's condition, and communicate them to appropriate staff. Ensure that information is communicated between on-call medical officers and new staff on different shifts (WHO 2003:F-3).

2.2.3 Causes of perinatal and neonatal deaths

The perinatal period is the time from the beginning of foetal viability until the end of the sixth day after birth (Perry et al 2010:36). Neonatal death is death of an infant within 28 days of birth. It is subdivided into early neonatal death which is death of an infant within the first week of birth, and late neonatal death , which is death of an infant between eight and 28 days of birth (Harrison 2008:2).

Sachdev (2006:718), in his global study on causes of neonatal deaths, found that the major direct causes of neonatal deaths globally were estimated to be infections (sepsis, pneumonia, tetanus and diarrhoea) (35%), being born preterm (28%) and birth asphyxia (23%). This is consistent with the global study done by Lawn, Wilczynska-Ketende and Cousens (2006:706), who found that the major causes of neonatal deaths were infections (sepsis/pneumonia, tetanus and diarrhoea) (35%), preterm births (28%), and asphyxia (23%).

Inadequate prenatal care or the absence of care is an important risk factor for congenital syphilis according to Marangoni, Moroni, Tridapalli, Capretti, Farneti, Faldella, Antuono and Cevenin (2008:1067).

Preterm births (28%), sepsis or pneumonia (26%) and birth asphyxia (23%) were found to be the main causes of neonatal deaths in India, in a study done by Baqui et al (2006:706). They also stated that the WHO attributed 30% of neonatal deaths to preterm births, and 27% to sepsis or pneumonia, 23% to birth asphyxia, 6% to congenital abnormalities, 4% to tetanus, 3% to diarrhoea and 7% to other causes in the South Asian regions. In this study, they found that the overall common causes of neonatal deaths were preterm births (27%), sepsis or pneumonia (24%), birth asphyxia or injury (31%). Preterm birth (26%) was the most common cause of deaths on day 0. On day one and during the first week of life, the proportion of deaths caused by birth asphyxia or injury was lower than on day 0 (14%). On days one to six the most frequent causes of deaths were preterm birth (at 30%) and sepsis or pneumonia (25%). The proportion of deaths caused by sepsis or pneumonia increased to 45% during days seven to 13, and 36% during days 14–27.

Patrick (2007:11), on perinatal mortality at Frontier Hospital, Queenstown, found that the main causes of neonatal deaths are hypoxia and immaturity, with infection and congenital abnormalities being less common.

A study done by Mohsin, Bauman and Jalaludin (2006:643) in New South Wales, Australia, found that the most common causes of stillbirths were conditions originating in the perinatal period, such as intrauterine hypoxia and asphyxia, congenital malformations, including deformities and chromosomal abnormalities, and disorders related to slow foetal growth, short gestation and low birth weight. The findings indicate that very low birth weight (less than 2000g) contributed 75.6% of the attributable risks to stillbirths and 59.4% neonatal deaths. Low gestational age (less than 32 weeks) accounted for 77.7% of stillbirths and 87.9% of neonatal deaths.

Al-Saady (2007:45) in a study of the causes of neonatal deaths in Al-Kadhymia teaching hospital, found that the main causes of neonatal deaths are respiratory distress syndrome (54.58%), sepsis (22.5%), congenital abnormalities (9.57%), birth asphyxia (8.14%) meconium aspiration (3.7%) and infant of diabetic mother at 1.42%.

A study conducted in six developing countries found that hypertensive disorders and spontaneous preterm delivery were the primary obstetric cause of neonatal deaths, while the main causes of early neonatal deaths were prematurity, asphyxia and congenital anomalies (Ngoc, Merialdi, Abdel-Aleem, Carroli, Purwar, Zavaleta, Campódonico, Ali, Hofmeyr, Mathai, Lincetto & Villar 2006:702).

Doskoch (2009:107) in his study in Latifabad, Pakistan, identified the causes as immaturity-related factors accounting for 26%, asphyxia or hypoxia (26%), infection (23%), congenital malformations (8%) and unclassified deaths (17%). Half of the neonatal deaths occurred among infants who weigh below 2500g at birth.

Velaphi and Pattinson (2007:104), state that intrapartum hypoxia (60%) is the most common primary obstetric cause of death in all different groups of hospital, with the rural hospitals reaching 81% in South Africa. Hypoxi-ischaemic encephalopathy (58%), meconium aspiration syndrome (21%), persistent foetal circulation (2.7%) and unclassified deaths (17.4%) were identified as the final causes of neonatal deaths.

According to Pattinson (2003–2005:14), the main causes of death in all weight categories are unexplained stillbirth, spontaneous preterm labour, intrapartum asphyxia and birth trauma. Intrapartum asphyxia and birth trauma remain the cause of death in babies with weights ≥2500g, which is associated with prolonged or obstructed labour, as indicated by the Perinatal Problem Identification Programme (PPIP).

2.2.4 Avoidable/preventable factors in neonatal deaths

According to Fraser et al (2006:1032), avoidable factors are acts or omissions by the patient, administration or healthcare worker which result in an adverse outcome for the mother and baby.

A study done in India by Mahavarkar, Madhu and Mule (2008:606) found that infants born to teenage mothers (less than 19 years) were 1.8 times more likely to have low birth weight which contributes to increased perinatal morbidity and mortality, compared with infants born to older mothers.

Kibel et al (2007:320) state that most avoidable or modifiable factors in South Africa are health-system related; they include unavailability of health services (facilities, medical and nursing staff, equipment and medication) and lack of or poor implementation of programmes and protocols for pregnant mothers and newborns. Common patient-related avoidable factors are failure to seek antenatal care, delay in seeking help and inappropriate response to danger signs.

Buchmann and Pattinson (2006:10), in their confidential enquiry into South African public hospitals with regard to babies who die from labour-related intrapartum hypoxia, found that in most of the deaths there was failure to detect signs of foetal distress, which indicates a deficiency in intrapartum foetal monitoring.

In South Africa, the following have been found to be the common causes of preventable factors. These include patient, administrative and health worker related factors.

- **Patient-related factors**

Patient-related preventable factors is when the woman, by doing something or not doing something, causes her own death or that of the baby (Fraser et al 2006:1034).

Patient-related factors are those that could have been prevented if the patient had reported and come to the health facility earlier. Among others, they include inappropriate response to poor foetal movements; never having initiated antenatal care; delay in seeking medical attention during labour; having booked late in pregnancy;

infrequent visits to an antenatal clinic; lack of transport from home to institution; inappropriate response to rupture of membranes; inappropriate response to antepartum haemorrhage; failure to return on the prescribed date; declining admission/treatment for personal/social reasons; attempted termination of pregnancy; alcohol abuse and delay in seeking help when the baby is ill (Pattinson 2003–2005:15; Velaphi & Pattinson 2007:103).

o **Administrative-related factors**

An administrative-related preventable factor is when something that is the responsibility of the health authorities causes the death of the mother and the baby (Fraser et al 2006:1034).

Administrative-related factors are beyond the health worker's reach. They depend on the actions of the management of the health facility (district, provincial and even national) in order to facilitate smooth functioning of health facilities in the prevention of morbidity and mortality. Factors like inadequate facilities/equipment in the neonatal unit/nursery; delay by medical personnel in calling for expert assistance; personnel not being sufficiently trained to manage the patient; the lack of an accessible neonatal intensive-care unit with ventilator; lack of transport between institution and institution; insufficient nurses on duty to manage the patient adequately; insufficient doctors available to manage the patient; personnel too junior to manage the patient; results of syphilis screening not being returned to the hospital/clinic; no response to a positive syphilis serology test; no syphilis screening performed at the hospital/clinic; no on-site syphilis testing available; anaesthetic delay, inadequate theatre facilities; lack of adequate neonatal transport; no dedicated high-risk antenatal care at the referral hospital; and staff rotation too rapid (Pattinson 2003–2005:16; Velaphi & Pattinson 2007:103).

o **Health-worker related factors during the antenatal care**

Health worker-related preventable factors is when a health professional, doctor or midwife did or did not do something that had a direct influence on the death of the mother or her baby (Fraser et al 2006:1034).

These are factors due to the health worker's negligence, ignorance and even lack of knowledge or inexperience which contribute to morbidity and mortality. These factors are: no response to maternal hypertension, no response to history of stillbirths or abruption, no response to poor uterine fundal growth; multiple pregnancy not being diagnosed antenatally; no response to apparent post-term pregnancy; foetal distress not being detected antenatally; physical examination of patient at clinic being incomplete; antenatal steroids not being given, foetal distress not detected antepartum; foetus not monitored and no response to history of poor foetal movement; inadequate/no advice given to mother; incorrect management of antepartum haemorrhage; no response to maternal glycosuria; incorrect management of premature labour; no antenatal response to abnormal foetal lie; and iatrogenic delivery for no real reason (Pattinson 2003–2005: 16; Velaphi & Pattinson 2007:103).

- **Health worker-related factors during intrapartum care**

These are factors during labour which contributed to neonatal death. Some of these factors are foetal distress not detected intrapartum; foetus monitored but foetal distress not detected, or foetus not monitored; management of second stage being prolonged with no intervention; inappropriate use of vacuum, inappropriate use of forceps. Medical personnel underestimated foetal size or overestimated foetal size. Also cited were poor progress in labour; Partogram not used, interpreted incorrectly or not used correctly; breech presentation not diagnosed until late in labour; multiple pregnancy not diagnosed intrapartum; and incorrect management of cord prolapse (Pattinson 2003–2005:17; Velaphi & Pattinson 2007:103).

- **Health worker-related factors during neonatal care**

These factors relate to neonatal care during delivery and in the neonatal unit. These include inadequacy of management plan, neonatal resuscitation, neonatal care and monitoring; incorrect management of the baby at the hospital or clinic, nosocomial infection or baby sent home inappropriately (Pattinson 2003–2005:17; Velaphi & Pattinson 2007:103).

o **Health worker-related delays**

These factors relate to the delays made by health workers in referring patients for secondary/tertiary treatment; delay by the doctor in responding to calls or doctor not responding to calls (Pattinson 2003–2005:17; Velaphi & Pattinson 2007:103).

Velaphi and Pattinson (2007:104) state that asphyxia-hypoxia occurs mainly in normal, term infants who would have been healthy. There is a need for prioritising the promotion of health to women and children and improving the management of labour, and the care and management of the newborn infants.

2.2.5 Evidence-based practice

According to Houser (2008:13) evidence-based practice is "the use of the best scientific evidence, integrated with clinical experience, and incorporating patient values and preferences in the practice of professional nursing care" and Tappen (2011:421) defines evidence-based nursing practice as the conscientious, explicit, and judicious use of theory-derived, research-based information in making decisions about care delivery to individuals or groups of patients and in consideration of individual needs and preference.

The study of Universal Neonatal Survival, Series 2, by Darmstadt, Bhutta, Cousens, Adam, Walker and Der Bernis (2005:980), identified the following evidence-based practice:

- **Antenatal**

During the antenatal period, supplementation with folic acid, calcium and immunisation has shown a decrease in neonatal deaths and prevention of some congenital abnormalities. Folic acid in the preconception period prevents 42% to 87% of neural tube defects. Tetanus toxoid immunisation reduces the incidence of neonatal tetanus by 88% to 100%. Calcium supplementation in pre-eclampsia reduces the incidence of low birth weight by 53%. Intermittent presumptive treatment for malaria reduces the PNMR by 47%. Detection and treatment of asymptomatic bacteriuria reduces the incidence of prematurity/low birth weight by 20 to 55% (Darmstadt et al 2005:980).

- **Intrapartum**

Conditions that have shown evidence of the reduction of neonatal deaths include management of preterm premature rupture of membranes, preterm labour and breech presentation, the use of the Partogram and clean deliveries. Antibiotics for preterm premature rupture of membranes reduce the incidence of infections by 13 to 47%. Corticosteroids for preterm labour reduce perinatal deaths by 25 to 52%. Detection and management of breech by caesarean section reduce perinatal and neonatal death by 14 to 90%. Labour surveillance by the use of the Partogram for early diagnosis of complications reduces early neonatal deaths by 40%. Clean deliveries reduce neonatal mortality by 58 to 78% and neonatal tetanus by 55 to 99% (Darmstadt et al 2005:980).

- **Postnatal**

There are some cost-effective measures that can be taken during the postnatal period which have an impact on the reduction of neonatal deaths. Resuscitation of the newborn baby reduces neonatal mortality by six to 42%. Breastfeeding reduces neonatal mortality by 55 to 87%. Prevention and management of hypothermia reduces neonatal mortality by 18 to 42%. Kangaroo mother care in low birth-weight infants in health facilities reduces the incidence of infections by seven to 75%, and community-based pneumonia case management reduces deaths by 18 to 35% (Darmstadt et al 2005:980).

The introduction of low-cost measures to improve the survival rate of very low birth weight infants, such as devolution of maternity services to the clinics, early use of nasal continuous positive airway pressure in respiratory distress associated with apnoea, hyaline membrane disease and meconium aspiration syndrome, breastfeeding, intermittent kangaroo mother care, training of nurses in neonatal medicine and monthly visits by a consultant neonatologist from a nearby tertiary hospital, had showed improvement in survival rate from 21% to 40% in a study conducted by Bondi and Adhikari (2007:10).

Bhutta, Memon, Soofi, Salat, Cousens and Martines (2008:455), in their pilot study of implementing community-based perinatal care in rural Pakistan, found that the stillbirth rate decreased from 65.9 to 43.1 per 1000 births and neonatal mortality rate decreased from 57.3 to 41.3 per 1000 live births.

2.2.6 Legislative framework for perinatal care in South Africa

The legislative framework of perinatal care is clearly described in various laws within South Africa. This should ensure that the rights of the mother and the unborn baby are protected.

- ***The Constitution of South Africa 1996 (Act No 108 of 1996)***

Chapter 2 of the Constitution pertains to the Bill of Rights. It binds the state to respect, protect, promote and fulfil the rights in the Bill of Rights. The following sections of the Constitution place a duty on the state to take steps within its available resources to achieve these rights (South Africa 1996:6).

- Section 11 of the Constitution states that: ‘Everyone has the right to life’ (South Africa 1996:7).
- Section 27 (1) a: ‘Everyone has the right to have access to health care services, including reproductive health care’ (South Africa 1996:13).
- Section 27 (3): ‘No one may be refused emergency medical treatment’ (South Africa 1996:13).
- Section 28 (1) c: ‘Every child has the right to basic health care services’. (South Africa 1996:13).

- ***Child health-related policies in South Africa***

In July 1994, The Minister of Health announced free health care for children under the age of six years and free health care for pregnant women (DoH 2002: 4).

- ***The White Paper on the transformation of the health care system in South Africa 1997***

In chapter 8, of the white paper on the maternal, child and women’s health (1997:49) the Department of Health has committed itself to achieving universal access to health services for children including infants, children under five, adolescents and women, while improving the services provided, contributing to the reduction of infant, child and maternal morbidity and mortality. The following are some of the principles to be applied:

- o Maternal, child and women's health (MCWH) services should be accessible to mothers, children, adolescents and women of all ages, the focus being on the rural and urban poor and farm worker.
- o MCWH services should be comprehensive and integrated.
- o Clear objectives and targets should be set at the national, provincial, district and community levels in accordance with the goals of the Reconstruction and Development Programme, the health sector and the United Nations Convention on the Rights of the Child.
- o Individuals, households and communities should have adequate knowledge and skills to promote positive behavioural related to maternal, child and reproductive health.
- o MCWH services should be efficient, cost-effective and of a good quality.
- o Women and men will be provided with services which will enable them to achieve optimal reproductive and sexual health (South Africa 1997:49).

- ***South African Nursing Council. 1990. Regulation R2488 of 1990. Pretoria: SANC***

- o Chapter 2 section 6: A registered midwife, when attending to a pregnant woman, should be able to assess adequately and refer appropriately if there are any abnormalities (R2488, 1990, Paragraph 6(1) (a, b, c).
- o Chapter 2 section 7: A registered midwife, when attending to a woman in labour, should stay with the patient till after the birth of the child and report any abnormalities or refer (R2488, 1990, Paragraph 7(1, 2, 3).
- o Chapter 2 section 8: A registered midwife, when attending to the mother and child at least once a day, shall not discharge them until their conditions are satisfactory, [and the mother is able to](d) ii care for herself and her child during the puerperium; iii recognise abnormalities that may occur and when and where to get assistance (R2488, 1990, Paragraph 8 (a, b, c, d (ii, iii).

- ***The United Nations Convention on the Rights of the Child (UNCRC) 1989***

Article 24 of UNCRC recognises the right of the child to the enjoyment of the highest attainable standard of health and facilities for the treatment of illness and rehabilitation. It obliges governments to act appropriately to:

(a) Diminish infant and child mortality rates.
(b) Ensure appropriate prenatal and postnatal care of mothers (United Nations 1989:9).

- ***African Charter on the Rights and Welfare of the Child 1999***

  - Chapter 1, Article 1 of the Charter obliges the state to recognise the rights, freedom and duties and to undertake the necessary steps in accordance with their Constitutional processes and with the provision of the present Charter, to adopt legislative or other measures to give effect to the provisions of the Charter.
  - Article 5 (1) of this Chapter one states that every child has an inherent right to life and the right shall be protected by law (Organization of African Unity 1999:1).

- ***National Health Act (Act No. 61 of 2003)***

Chapter 2 (5) states that a health care provider, health worker or health establishment may not refuse a person emergency medical treatment (South Africa 2003:15).

- ***The Millennium Development Goals***

The global communities, South Africa included, committed themselves to the global goals, three of which directly relate to maternal and child health.

  - MDG 4: To reduce child mortality by two-thirds between 1990 and 2015 in under-five child mortality (United Nations 2008:20).
  - MDG 5: To improve maternal health by three-quarters between 1990 and 2015 in maternal mortality (United Nations 2008:24).
  - MDG 6: To combat HIV/AIDS, malaria and other diseases by 2015 and begin to reverse the spread of HIV/AIDS (United Nations 2008:28).

- ***Safe motherhood in South Africa***

The WHO developed initiatives for safe motherhood which South Africa adopted as 'pillars of safe motherhood':

- o Choice on contraception, which ensures that individuals and couples have the information and services to plan the timing, number and spacing of pregnancies.
- o Antenatal care, with the identification of risk factors and early diagnosis of pregnancy complications and appropriate management, and health education.
- o Clean and safe delivery, which ensures that all health workers have the knowledge, skills and equipment to perform clean and safe delivery and provide postpartum care to mother and baby.
- o Essential obstetric care, which ensures that essential care for high risk pregnancies and complications, is made available to all women who need it.
- o Choice on termination of pregnancy, which provides women who have unwanted pregnancies with a legal, safe and acceptable choice (DoH 2002:5).

2.2.7 Stage three: Acting to achieve change

After data analysis, reasons for the standard not being met are identified and a plan of improvement is developed. Some of the areas that may need to be addressed to achieve clinical effectiveness are: education, when lack of knowledge was identified as the reason for poor practice; changing the system when access to supplies, system of documentation, staff skills, and work load were identified as problem areas; and changing behaviour when staff performance was identified as a reason for failure to meet best practice. Re-auditing is necessary after the action plan has been implemented (Pearson et al 2007:146).

2.3 CONCLUSION

This chapter discussed the literature on the audit cycle and its stages, including the WHO standards, the South African maternity guidelines, the causes of neonatal deaths, and the avoidable factors in neonatal deaths, recommendations on the prevention of neonatal deaths, evidenced-based practice and the legislative framework for perinatal care services globally and in South Africa.

Chapter 3 will discuss the research design and methodology of the study.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research design and methodology used in the study. The population, data collection, validity and reliability as well as ethical considerations are also discussed.

The overall aim of the study was to propose strategies to reduce the high neonatal mortality rate at a selected hospital in the Mpumalanga province, including that of patients admitted from its maternity unit and its feeder clinics.

The purpose of the study was to explore the factors contributing to neonatal deaths at the hospital under study so as to attempt to lower the neonatal mortality rate.

The research objectives that guided the study were to

- determine underlying contributory factors to neonatal deaths in an obstetric unit
- propose strategies for midwifery practice in order to prevent or reduce neonatal deaths

3.2 RESEARCH SETTING

The setting is the location in which a study is conducted, as defined by Burns and Grove (2011:352), supported by Polit and Beck (2008:766), who define setting as the physical location and conditions in which data collection takes place in a study.

The setting for this study was the hospital under study in the Mpumalanga province of South Africa, Ehlanzeni District, Bushbuckridge Local Municipality.

3.3 RESEARCH DESIGN

Babbie and Mouton (2007:74) define a research design as a plan or blueprint of how the researcher intends to conduct the research. It is the overall approach to or an outline of the study that details all the major components of the research (Houser 2008:183).

The researcher used a quantitative, non-experimental, descriptive, exploratory and retrospective (ex-post facto) design in order to explore and describe the factors contributing to neonatal deaths.

3.3.1 Quantitative approach

Quantitative research is a process which consists of stating in advance the research questions or hypothesis, operationalising the concepts and devising or selecting in advance the methods of data collection and analysis, finally presenting the findings in numerical and or statistical language (Parahoo 2006:48). According to Burns and Grove (2011:17; 24), quantitative research is a formal, objective, systematic process in which numerical data are used to obtain information about the world. These authors add that quantitative research is a formal, objective, rigorous, systematic process for generating information about the world. It is conducted to describe new situations, events, or concepts in the world.

Parahoo (2006:55) also states that in quantitative research the data is collected by the use of predetermined, structured and standardised methods, such as structured questionnaires, structured observations, structured interviews and measuring tools; Polit and Beck (2008:16) state that in quantitative research, numerical information is gathered using formal instruments and is analyzed with statistical procedures.

The researcher adopted a quantitative approach. This approach is relevant for the study because concepts had been given operational meanings, the prepared audit schedule was used to collect data and a program for data analysis was chosen. The findings in this study were presented in a numerical and statistical form. The researcher made use of a structured audit schedule which was predetermined and planned in advance for data collection; thus it could not be changed once data was collected and the objectivity of data collection was maintained.

3.3.2 Non-experimental approach

LoBiondo-Wood and Haber (2006:239) explain that non-experimental research designs are used in studies in which the researcher wishes to explore events, people, or situations as they naturally occur.

According to Polit and Beck (2008:759), non-experimental research is defined as studies in which the researcher collects data without introducing an intervention. Brink et al (2007:102) add that in non-experimental design there is no manipulation of the independent variable, and therefore no intervention, nor is the setting controlled.

The researcher in this study wished to explore factors that caused neonatal deaths. These events were not manipulated by the researcher, nor was the setting manipulated. Events were followed according to the way in which they occurred, without any intervention from the researcher, who wished to objectively identify the factors contributing to neonatal deaths.

3.3.3 Descriptive design

LoBiondo-Wood and Haber (2006:240) explain the descriptive design as a collection of detailed descriptions of existing variables, and the use of the data to justify and assess current conditions and practices or to make more plans for improving practices (in this case health care practices). Burns and Grove (2011:24) explain descriptive design as the exploration and description of phenomena in real-life situations, where it provides an accurate account of characteristics of particular individuals, situations or groups.

Brink et al (2007:102) explain that descriptive design is used where more information is required in a particular field through the provision of a picture of the phenomenon as it occurred naturally. Burns and Grove (2011:24) state that through descriptive studies researchers describe what exists, determine the frequency with which something occurs, discover new meanings and categorise information. The outcome of descriptive research is the description of concepts, identification of relationships, and development of hypotheses that provide a basis for future quantitative research.

The researcher in this study chose to use the descriptive design to assess the factors which contribute to the neonatal deaths in a selected Level I hospital in the Mpumalanga province, since more information is needed to explain the factors leading to neonatal deaths in the hospital under study. The information will assist in making plans for improving health care practices if they are lacking, in the prevention of neonatal deaths.

3.3.4 Exploratory design

Exploratory studies are used to make preliminary investigations into relatively unknown areas of research. They attempt to find new insights into phenomena (Terre Blanche, Durrheim & Painter 2006:44). Shi (2008:45) explains that exploratory research is conducted when relatively little is known about the phenomenon under study or the researcher is examining a new area of interest where the topic has been studied by others but not by the researcher.

In this study, the researcher used the exploratory design to investigate the factors contributing to neonatal deaths in a selected Level I hospital in the Mpumalanga province, as little is known about the causes of neonatal deaths in this hospital. The data will also be used to assess current practices and to make recommendations or plan strategies for improving the health care practices.

3.3.5 Retrospective design

Polit and Beck (2008:272), state that in retrospective design, the phenomena, which have already occurred, have their explanation in the past. Researchers have to work backwards and search for variables or factors to account for them. According to Houser (2008:45), in a retrospective study, the researcher studies events that have already occurred and have been recorded. It is not possible to manipulate events that occurred in the past.

The researcher in this case studied events that had already occurred that led to neonatal deaths, by auditing patients’ records. These events could not be manipulated or controlled to affect the phenomenon under study.

3.4 POPULATION

According to Polit and Beck (2008:337), a population is the entire aggregation of cases in which a researcher is interested, while Parahoo (2006:256) defines population as the total number of units from which data can be potentially collected, these may be individuals, organisations, events or artefacts.

For this study, the population comprised all live births in the district hospital under study from January 2009 to December 2009.

According to Polit and Beck (2008:338), the target population is defined as the aggregate of cases about which the researcher would like to generalise, supported by Houser (2008:211) who states that target population is the entire set of subjects that are of interest to the researcher.

The target population for this study was all newborn babies admitted to the neonatal care unit during January to December 2009.

3.5 SAMPLE AND SAMPLING

A sample is a set of elements that make up the population, as stated by LoBiondo-Wood and Haber (2006:263); according to Brink et al (2006:124), a sample is a part or fraction of a whole or a subset of a larger set selected by the researcher to participate in a research study. It consists of a selected group of elements of analysis from a defined population.

For this study, the sample comprised all newborn babies admitted to the neonatal unit from January to December 2009 with gestational age of 28 weeks or more and weighing 1000 g or more, who died within a month or were discharged home alive within a month of delivery.

3.5.1 Eligibility criteria

Eligibility criteria define who is included in the population (Polit & Beck 2008:338). Burns and Grove (2011:242) state that eligibility criteria include a list of characteristics essential for eligibility or membership in the target population: those characteristics that an element must possess to be part of the target population. Exclusion criteria are those characteristics that can cause an element to be excluded from the target population.

In this study, the researcher used all records of neonatal deaths of babies that were delivered alive in the selected hospital or on the way to the hospital under study from January to December 2009, with a gestational age of 28 weeks and above, weighing 1000 g and above and who died within one month of delivery.

A control group included neonates who were delivered alive in the hospital under study or on the way to hospital and admitted in the neonatal care unit with a gestational age of 28 weeks and above, weighing 1000 g and above and discharged home alive within one month of delivery from January 2009 to December 2009. Babies born to mothers either attending or not attending the antenatal clinic were also included in the study.

Neonatal deaths occurring at home or on the way to the hospital or clinic were not included in this study. Babies, who died weighing below 1000 g, even if born alive, were not included in this study. Babies dying after one month of delivery were excluded from the study.

3.5.2 Sample size

According to LoBiondo-Wood and Haber (2006:278), the larger the sample, the more representative of the population it is likely to be. Smaller samples produce inaccurate results. De Vos, Strydom, Fouché and Delport (2011:195) state that if the population is small, the sample should comprise a large percentage of the population. Larger samples enable researchers to draw more representative and more accurate conclusions, and to make more accurate predictions than smaller samples. This is also supported by Polit and Beck (2008:348), who indicate that the larger the sample, the more representative of the population it is likely to be and the smaller the sampling error.

The researcher in this study used all the elements of the population because the population of 100 or less is small and a sample could not be drawn from it. The rationale behind using the total population is because of the representativeness of the sample.

Of the 110 neonatal deaths identified in the delivery register and neonatal admission register, the researcher was able to access 72 records. Twelve records were of neonatal deaths of babies with a birth weight of less than 1000 g, so they were not included in the study. Thirty-eight records of neonatal deaths were not available for study due to either being lost or misplaced. Thus only 60 records were accessed of the neonatal deaths that met the inclusion criteria.

Forty records were those of babies who were delivered from January to December 2009 and discharged alive. These records were sampled using systematic sampling technique to meet a total sample size of 100.

3.5.3 Sampling

Sampling is the process of selecting representative units of a population for study in a research investigation. The purpose of sampling is to increase the efficiency of a research study so that, when it is done properly, the researcher can draw inferences and make generalisations about the population without examining each unit in the population (LoBiondo-Wood & Haber 2006:263). Brink et al (2007:124) support this viewpoint.

In this study, sampling for the neonatal deaths was done through census and probability sampling; the systematic sampling technique was used for the control group.

3.5.3.1 Sampling frame

A sampling frame is defined by Houser (2008:215) as the potential participants who meet the definition of the population and are accessible to the researcher. Shi (2008:269) states that sampling frame is a list of sampling units from which the sample is actually selected and determines the scope of the study population.

The researcher in this study used all the newborn babies that were admitted in the neonatal unit and were discharged home alive to make a sampling frame for the control group from January to December 2009 with a gestational age of 28 weeks and above, or weighing 1000 g and above.

3.5.3.2 *Probability sampling*

According to Houser (2008:219), probability sampling is a sampling process in which every member of the available population has an equal probability of being selected for the sample. Burns and Grove (2011:346) state that the probability sampling approach increases the representativeness of the sample. Every element of the population has a probability higher than zero of being selected for the sample.

Shi (2008:270) states that probability sampling requires the specification of the probability that each sample element will be included in the sample. A sampling frame and some random procedure of selection that makes possible probability estimation and the use of inferential statistics are used.

In this study, random sampling, with systematic sampling technique for the control group, was used from the sampling frame of all babies who were admitted in the neonatal unit with a gestational age of 28 weeks and above or weighing 1000 g and above who were discharged home alive.

3.5.3.3 *Sampling technique*

The sampling techniques used for this study are the census and systematic sampling.

- **Census**

Collins Concise English Dictionary (2001:241) defines census as any official count, and Wood and Ross-Kerr (2011:123) refer to census as a population study which is used in descriptive design in the collection of data, where the total population is surveyed using structured data-collection methods.

De Vos et al (2011:195), state that if the population is small, the sample should comprise a large percentage of the population. Larger samples enable researchers to draw more representative and more accurate conclusions, and to make more accurate predictions than smaller samples.

For this study, a census of the total population of 60 neonatal death records was used, as it was the appropriate sampling method to ensure generalisability from a small population.

- **Systematic sampling**

According to Brink et al (2007:129), systematic sampling involves selecting elements at equal intervals, based on the supposition that cases are not added to the list in a systematic way that coincides with the sampling system. Burns and Grove (2011:349) state that systematic sampling can be conducted when an ordered list of all members of the population is available by selecting every *k*th individual on the list, using a starting point selected randomly; this agrees with Shi (2008:273), who states that systematic sampling selects every *k*th element from the sampling frame after a random start.

A list of the total population is obtained with elements listed randomly to avoid sampling bias and the sample not being truly representative of the population. The sampling interval is determined by dividing the size of the population by the size of the sample. A starting point is chosen randomly. Other elements are selected based on the sampling interval (Brink et al 2006:129; Shi 2008:273).

The researcher in this study used systematic sampling for the control group, as the control group should be selected for the results of the study to be validated.

Neonates who were admitted into the neonatal unit and were discharged alive from January to December 2009 with a gestational age of 28 weeks and above, weighing 1000 g and above were sampled. One hundred neonates were randomly selected and a sampling frame made. To determine the sampling interval, the researcher divided 100 by 40. This gave the researcher an interval of 3, i.e. every third neonate from the sampling frame was selected for the sample. From the 100 neonates, the first was randomly sampled then every third neonate from the sampling frame was chosen, to make a total of 40 neonates.

3.6 DATA COLLECTION

According to Burns and Grove (2011:430), data collection is the process of selecting subjects and gathering data from these subjects. The actual steps of collecting the data are specific to each study and are dependent on the research design and measurement methods. Data may be collected by observing, testing, measuring, questioning or recording, or any combination of these methods, and the researcher is actively involved in this process either by collecting data or supervising data collectors.

3.6.1 Characteristics of a structured data collection tool

A structured data collection tool is the formal document used to collect and record information (Polit & Beck 2008: 370). They add that the structured data collection tool has the ability to collect unambiguous and easy-to-count answers, leading to quantitative data analysis. It is a relatively economical method when used with large samples of elements.

The structured data collection tool used for this study is in the form of an audit tool developed by the researcher from the literature review.

Data collection employed by the researcher needs to be:

- *Objective*: the data must not be influenced by anyone who collects the information.
- *Systematic*: the data must be collected in the same way by everyone who is involved in the collection of data.
- *Consistent*: the data are collected from each file in the study in exactly the same way or as close to the same way as possible, which will minimise the bias introduced when more than one person collects the data (LoBiondo-Wood & Haber 2006:317).

3.6.2 Data collection tool

In this study, the researcher made use of an audit tool to collect data from the records of patients.

The following section explains how the instrument was developed so that it was objective and systematic.

3.6.2.1 Development of the audit tool

The data collection tool was developed on the basis of the literature search, which identified the important points in the study. The researcher developed a set of specific items based on WHO clinical standards for maternal and neonatal care and guidelines for maternity care in South Africa and the literature review.

The data collection tool was evaluated for external validity, internal validity, content and face validity by colleagues who are experts in the field of obstetrics and neonatal care, including obstetricians, paediatric doctors, advanced midwives and experienced midwives.

The researcher in this study used the audit tool to collect data from the records of neonatal deaths in hospital A. The audit tool included the following sections:

- Section A – Assessment on the first antenatal visit
- Section B – Assessment on subsequent antenatal visits
- Section C – Assessment on admission during labour
- Section D – Assessment during intrapartum care
- Section E – Management of the second stage of labour
- Section F – Neonatal care

3.6.2.2 Rationale for using a structured audit tool

According to Bowling (2009:8), an audit is directed at the maintenance and achievement of quality in health care. Audit aims to improve patient outcome, develop cost-effective use of resources; and have an educational function for health professionals. It should lead to change in clinical practice by encouraging reflective culture of reviewing current practice; and by inducting changes which may lead to better patient outcomes and satisfaction.

Records or available data are forms of information that are collected from existing materials, such as hospital records, historical documents or video tapes and are used to answer research questions in a new manner (LoBiondo-Wood & Haber 2006:328).

Brink et al (2007:154) state that records, admission charts, and care plan statements are important and economical sources of information. These documents permit an examination of trends over time and eliminate the need for the researcher to seek cooperation from participants.

The researcher in this study chose an audit tool to identify the contributory factors to neonatal deaths through assessing the clinical care given to the mothers during pregnancy and labour, and the care given to the newborn babies, against the clinical standards set by the WHO and Department of Health in South Africa.

This method of data collection was economical for the researcher, since the records were easily accessible and no consent or cooperation was needed from the participants. As the audit tool had structured items, the data collected was objective, consistent with less bias, because the researcher collected data alone.

3.6.2.3 Pre-testing the audit tool

De Vos et al (2011:171) state that newly constructed questionnaires in their semi-final form should be thoroughly pilot-tested before being utilised in the main investigation. This ensures that errors are rectified immediately at little cost.

The data collection tool was pre-tested on five neonatal cards, which did not form part of the study, before the actual collection of data.

3.6.3 Data collection process

Permission to collect data was sought from the Research and Ethics committee at Unisa (Department of Health Studies), the Research and Ethics committee in Mpumalanga province and the hospital management and the supervisor of the maternity unit at the hospital under study.

Data was collected in the record section, where all files of patients are kept under lock and key. Records were not removed from the record section to maintain confidentiality. Permission was granted to access the records for the purpose of this research by the clerk supervisor.

The researcher audited the records and entered the information in the computer herself. After recording the information, a professional who is involved in research work in the hospital checked two records to verify whether the information had been correctly entered.

3.7 DATA ANALYSIS

Data analysis is the systematic organisation and synthesis of research data and, in quantitative studies, the testing of hypotheses using those data (Polit & Beck 2008:751).

The researcher used descriptive statistics to provide answers to the research questions. Descriptive statistics allowed the researcher to organise the data in ways that gave meaning and facilitated insight and to examine the phenomenon from a variety of angles. Descriptive statistics include frequency distributions, measures of central tendency, measures of dispersion and standardised scores (Burns & Grove 2011:537).

Descriptive statistics were used to describe and summarise data, as they can convert and condense a collection of data into organised, visual representations of data to give it meaning for the readers.

In this study, the researcher made use of a professional statistician to analyse and summarise the data.

3.8 VALIDITY AND RELIABILITY

In the following section, the validity and reliability of this research are discussed.

3.8.1 Validity

Validity is defined by Polit and Beck (2008:457) as the degree to which an instrument measures what it is supposed to measure.

3.8.1.1 External validity

External validity refers to the degree to which the results of the study can be generalized to other (Tappen 2011:56). External validity was achieved by using the total population to increase the generalisability of the research findings.

3.8.1.2 Internal validity

Internal validity is concerned with minimizing the effects of extraneous or confounding factors that may interfere with interpretation of the results (Tappen 2011:55). The audit tool in this study was pre-tested to ensure that it measured what it was supposed to measure, i.e. the factors contributing to neonatal deaths.

3.8.1.3 Content validity

The content validity refers to the degree to which the questions or items in the questionnaire adequately represent the phenomenon being studied (Parahoo 2006:304).

The audit tool was validated by asking experts in the field, such as advanced midwives, experienced midwives, the head of the obstetric unit and staff with research experience to give their inputs on the tool before it was used for data collection. Corrections were made and the audit tool refined before it was used. Literature was also reviewed to ensure that the relevant items were included in the audit tool.

3.8.1.4 Face validity

Face validity means that the instrument looks like it measures the concepts it is supposed to measure. Houser (2008:255) as well as Tappen (2011:140) states that it means that the measure looks appropriate. Experts in obstetrics and neonatal care and staff with research experience were given the audit tool to check if it appeared to measure what it was supposed to measure; inputs were given and corrections made accordingly.

3.8.2 Reliability

De Vos et al (2011:162) define reliability as the stability or consistency of the measurement. If the same variable is measured under the same conditions, a reliable measurement procedure produces identical measurements and a measuring instrument is able to yield consistent numerical results each time it is applied. Burns and Grove (2011:374) point out that reliability is concerned with the consistency of the measurement technique.

The reliability of the audit tool was assessed by doing a pre-test before it was used for the study, to ensure that it was stable and consistent.

3.9 ETHICAL CONSIDERATIONS

Houser (2008:53) defines ethics as “the study of right and wrong” and Tappen (2011:173) defines research ethics as “norms for conduct that distinguish between acceptable and unacceptable behaviour” when doing research. Ethical considerations in the conduct of research were followed to prevent ethical dilemmas. To ensure the ethical conduct of the study, permission to conduct the study was sought from the Research and Ethics Committee at Unisa (Department of Health Studies), the Research and Ethics Committee in Mpumalanga province and the hospital management and the supervisor of the maternity unit at hospital A.

Furthermore, the following ethical principles were adhered to according to the principles of the Belmont Report (1978).

3.9.1 Beneficence

According to Polit and Beck (2008:170), beneficence encompasses the maxim: “Above all, do no harm”. The participants could be harmed physically, psychologically, economically and socially. Participants should not be put at a disadvantage or exposed to situations for which they have not been prepared.

In this study, the researcher used a non-experimental design, and people were not used as participants, but information was collected from the records of patients; thus no harm could befall them or participants be exposed to situations for which they were not prepared.

3.9.2 Respect for human dignity

Polit and Beck (2008:171) describe this principle as the right to self-determination and the right to full disclosure. Participants have the right to decide voluntarily whether to participate in a study without risking any penalty or prejudicial treatment, as much as they have the right to ask questions. They have the right to make informed, voluntary decisions about study participation, which requires full disclosure.

The researcher in this study used covert data collection. Covert data collection includes audits of existing records that have been stripped of individual identifiers (e.g. hospital patients' names and addresses). This type of data collection may be ethically acceptable (Polit & Beck 2008:172). The researcher provided privacy by not using the names, addresses and hospital numbers of the participants. After the information had been collected, a unique number was allocated to the chart for identification. This kept the information anonymous and no links could be made to the patients or care providers. Information was kept confidential by leaving the records in the record room. No records were taken out of the record section.

3.9.3 Justice

This principle applies to the right to fair treatment and right to privacy (Polit & Beck 2008:173).

In this study, the researcher kept the information collected anonymous by keeping the information in a safe place known only to the researcher, and any information linked to the participants was kept confidential.

3.9.4 Confidentiality

According to Burkhardt and Nathaniel (2008:67), confidentiality refers to the right of an individual to control personal information or secrets that are disclosed to others. It demands nondisclosure of private or secret information about another person with which one is entrusted. Shi (2008:9) defines confidentiality as not making identifying information available to anyone not directly involved in the study. Polit and Beck (2008:180) state that privacy is protected through anonymity, which is the most secure means of protecting confidentiality, when even the researcher cannot link participants to their data. Confidentiality in the absence of anonymity is a pledge that any information participants provide will not be publicly reported in a manner that identifies them and will not be made accessible to others.

The researcher in the study maintained confidentiality by keeping the records anonymous, as described in section 3.9.2.

3.10 CONCLUSION

This chapter described the research design and methodology in detail. The researcher collected data in person and ethics was considered in the collection of data.

Chapter 4 discusses the results of the research.

CHAPTER 4

Data analysis and findings

4.1 INTRODUCTION

The data analysis and findings of the study are discussed in this chapter. The data collection tool used in this retrospective study was analysed to ensure that the data gathered were presented clearly with the aid of tables, percentages and graphs.

The purpose of the study was to explore the contributory factors in neonatal deaths at a selected district hospital in the Mpumalanga province with the aim of bringing down the high neonatal death rate.

The overall aim of the study was to propose strategies to prevent high neonatal death rates at a selected district hospital/maternity unit and its feeder clinics.

The researcher in this study used an audit tool to collect data from the records of neonatal deaths in hospital A. The audit tool included the following six sections:

Section A
This section comprised items on the assessment of the mother on the first antenatal visit.

Section B
This section comprised items on the assessment of the mother at subsequent antenatal visits.

Section C
This section comprised items on the assessment of the mother on admission during labour.

Section D

This section comprised items on the assessment of the mother during intrapartum care.

Section E

This section comprised items on the management of the mother during the second stage of labour.

Section F

This section comprised items pertaining to neonatal care.

The following symbols will bear the following meaning in the interpretation of the findings:

N = Total number of respondents
n = Total of subsections
f = Frequency

4.2 DATA COLLECTION

According to Burns and Grove (2011:430), data collection is the process of selecting subjects and gathering data from these subjects. The actual steps in the collection of the data are specific to each study and are dependent on the research design and measurement methods. Data may be collected by observing, testing, measuring, questioning or recording or any combination of these methods and the researcher is actively involved in this process either by collecting data or by supervising data collectors.

Of the 110 neonatal deaths recorded in the delivery register and neonatal admission register, the researcher was able to access 72 records. There were 12 records of neonatal deaths of babies with a birth weight of less than 1000 g. These were not included in the study.

Thirty-eight records of neonatal deaths were not available for study because they had either been lost or misplaced. The records that were accessed were of 60 neonatal deaths that met the inclusion criteria.

Forty records of babies born between January and December 2009 and discharged alive were sampled, using a systematic sampling technique from the maternity register to achieve a total sample size of 100.

The data were collected in the filing section by the researcher, using the audit tool and entered into the Excel sheet on the computer provided by the statistician.

This information was protected by a security password to which only the researcher had access.

4.3 DATA ANALYSIS

Data analysis is the systematic organisation and synthesis of research data and, in quantitative studies, the testing of hypotheses using those data (Polit & Beck 2008:751).

The data captured from the records were subjected to computer analysis with the assistance of a professional statistician, converted into percentages and collated in the form of tables, graphs and figures to make the presentation meaningful. The data were analysed in accordance with the research questions.

4.3.1 Section A – First antenatal visit

According to the DoH (2007:19), antenatal care attempts to ensure the best possible pregnancy outcome for women and their babies through antenatal preparation. This is achieved through screening during pregnancy to identify possible problems that may occur during birth, assessment of pregnancy risks, treatment of problems that may arise during the antenatal period, providing medication that may improve the pregnancy outcome, provision of information and physical and psychological preparation for childbirth and parenthood

Section A of the audit tool was developed to analyse the first antenatal visits with regard to history- taking, physical examination and investigations.

According to the DoH (2007:20), the first antenatal visit is the most crucial visit where baseline data and all relevant history are taken into account and investigations done. A complete assessment of gestational age and risk factors that may threaten the life and wellbeing of the mother and the child may be made at the first antenatal visit.

4.3.1.1 History taking

In this study, the antenatal records were audited and information with regard to age, previous obstetric history, medical history and present obstetric history was analysed.

A full and relevant history is recorded regarding current pregnancy, previous pregnancies and their complications and outcomes, medical conditions (including psychiatric problems and previous operations) familial and genetic disorders, allergies, use of medication, use of alcohol, tobacco and other substances, family and social circumstances, cultural aspects and medical problems, e.g. HIV/AIDS as indicated by the DoH (2007:20).

4.3.1.1.1 Age distribution

Figure 4.1 shows the age distribution of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

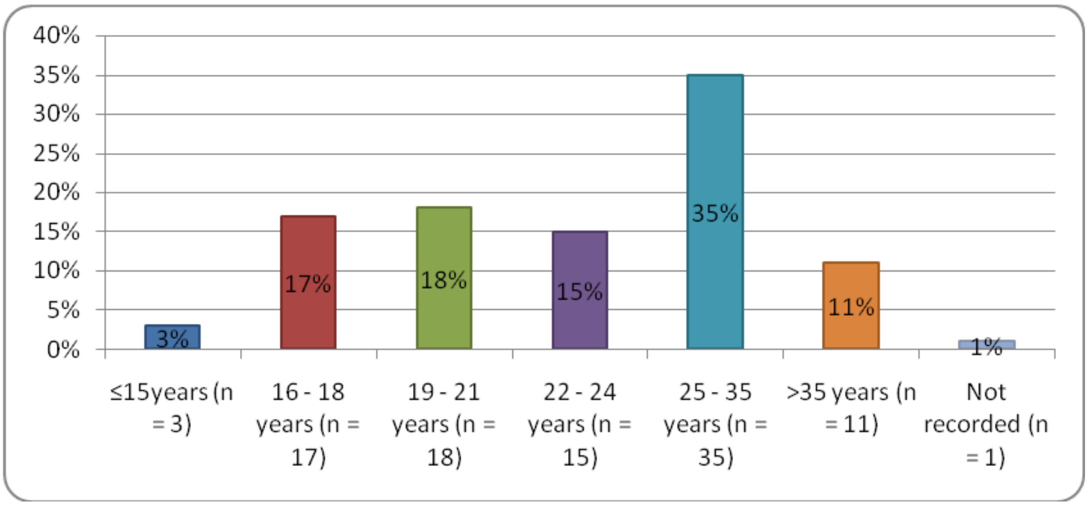

Figure 4.1

Age distribution (N=100)

Figure 4.1 shows that mothers aged between 25 and 35 years accounted for 35% (n=35) of the admissions, followed by those aged between 19 and 21 years (18% - n=18), those aged between 16 and 18 (17% - n=17) and those aged between 22 and 24 (15% - n=15). Mothers older than 35 years accounted for only 11% (n=11) and those under 15 for 3% (n=3).

Figure 4.2 shows the neonatal deaths in relation to the maternal age of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

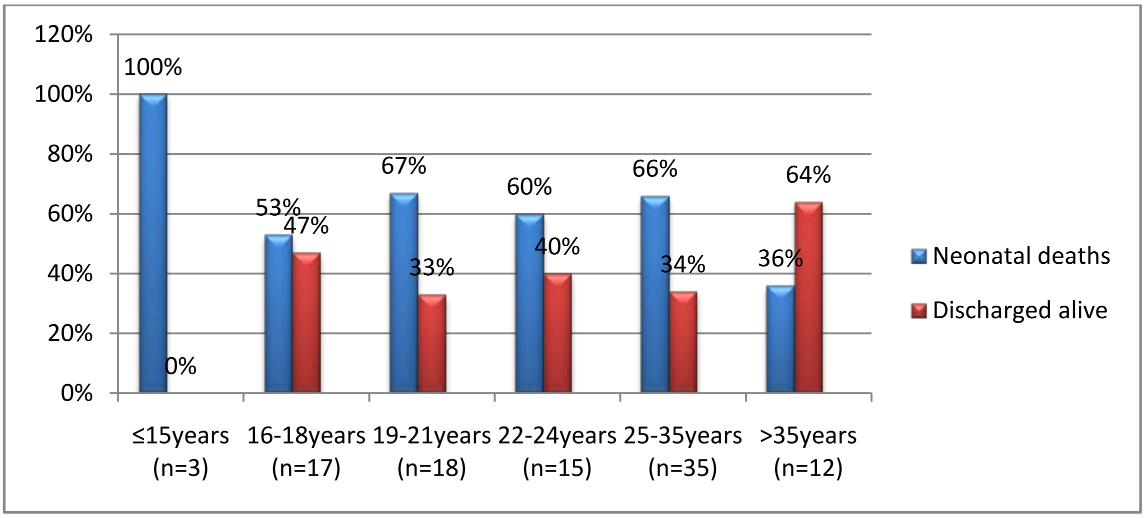

Figure 4.2

Neonatal deaths in relation to maternal age (N=100)

The neonatal death rate for mothers under 15 years (n=3) was 100%. In the 17 mothers between the ages of 16 and 18 the neonatal death rate was 53% (n=9), while the 18 mothers aged between19 and 21 accounted for 67% (n=12) of the neonatal deaths. The 15 mothers aged between 22 and 24 had a neonatal death rate of 60% (n=9). There were 35 mothers aged between 25 and 35 with a neonatal death rate of 66% (n=23). The 12 mothers aged over 35 had a neonatal death rate of 36% (n=4).

Forty-seven percent of babies of mothers aged between 16 and 18 (n=17) were discharged alive. For mothers aged between 19 and 21 (n=18) the rate was 33% (n=6), that for mothers aged between 22 and 24 (n=15) was 40% (n=6); for mothers aged 25 to 35 (n=35) it was 34% (n=12), and for mothers over 35 (n=12), 64% (n=7).

These results are consistent with the study done in India by Mahavarkar, Madhu and Mule (2008:606), who found that teenage mothers were 1.8 times more likely to give birth to babies with a low birth weight or to deliver prematurely. This contributes to increased perinatal morbidity and mortality. Kongnyuy, Nana, Fomulu, Wiysonge, Kouam and Doh (2008:152), in their study of adverse perinatal outcomes of adolescent pregnancies in Cameroon, found that adolescent mothers had higher rate of adverse foetal and maternal outcomes. These authors found adverse foetal outcomes in 48.9% of the mothers they investigated and early neonatal deaths in 4.9% of adolescents as compared to 32.5% and 2.3% adverse foetal outcomes and early neonatal deaths respectively in mothers in the age group 20–29 years. This may be due to young mothers' delay in accessing antenatal care, thus reducing the opportunity for health professionals to address the specific needs of adolescent mothers (O'Leary, Bower, Knuiman & Stanley 2007:547).

This study revealed that advanced maternal age does not impact on neonatal mortality or morbidity and is consistent with the findings of the study by Battin and Sadler (2010:222) who demonstrated that there is no increased risk of adverse outcomes in infants born to older mothers.

4.3.1.1.2 Antenatal booking status

Figure 4.3 depicts the antenatal booking status of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

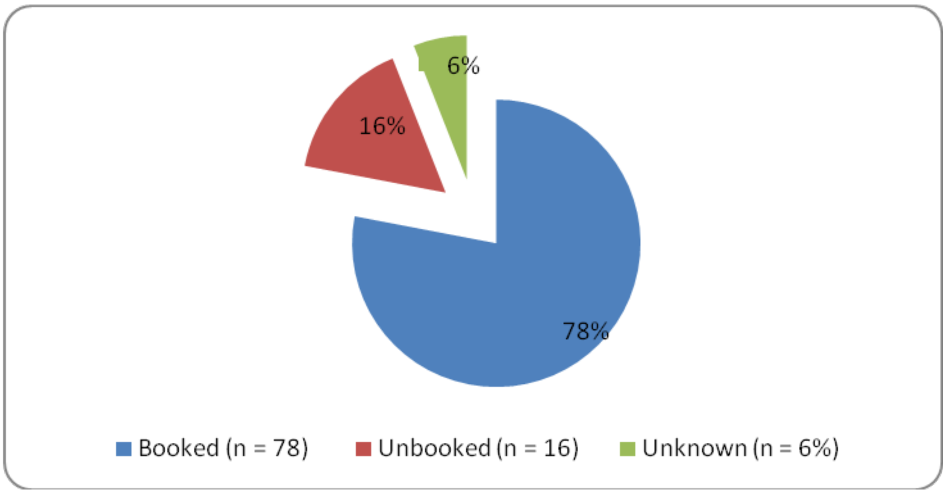

Figure 4.3

Antenatal booking status (N=100)

According to the findings, 78% (n=78) of mothers were booked, 16% (n=16) were not booked, and in the remaining 6% (n=6) there was no indication whether the mothers were booked or not because the patients' records contained no indication either way.

All the mothers who were booked (78%) attended the local antenatal clinic either in the hospital or from the referral clinics. There was no antenatal clinic attendance by patients of private practitioners.

Figure 4.4 depicts the neonatal deaths in relation to the antenatal booking status of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

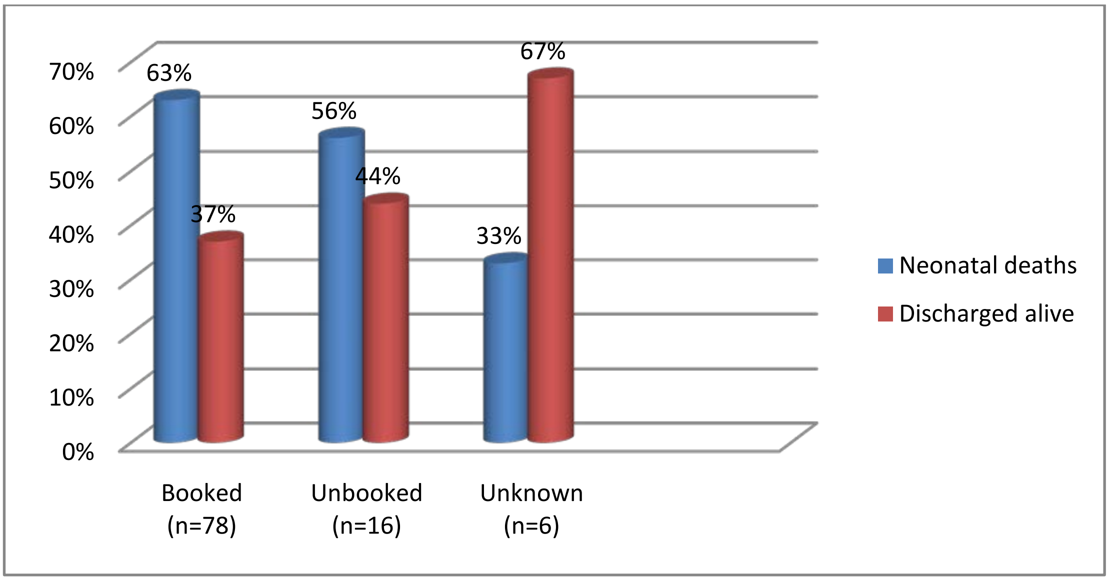

Figure 4.4

Neonatal deaths in relation to maternal booking status (N=100)

Of the booked mothers (n=78), 63% (n=49) experienced neonatal deaths. The neonatal death rate in the unbooked mothers (n=16), was 56% (n=9) and in the mothers whose booking status was unknown (n=6) the neonatal death rate was 33% (n=2).

Thirty-seven percent (n=29) of the booked mothers (n=78), 44% (n=7) of the unbooked mothers (n=16) and 67% (n=4) of the mothers whose booking status was unknown (n=6) were discharged with their babies alive.

These findings contrast with the results in the study conducted by Chen, Wen, Yang and Walker (2007:124) in the United States of America and by Raatikainen, Heiskanen and Heinonen (2007:268) in Finland, who found that inadequate prenatal care was associated with high neonatal mortality, which is usually more prevalent among younger, black and unmarried women. In the abovementioned study age and marriage status were not compared to booking status; as a result, the researcher in this study is not in a position to agree or disagree with the above findings.

According to the researcher, the reasons for this difference could be delay in seeking help and inappropriate response to danger signs. These are cited by Kibel et al (2007:320) as some of the common patient-related preventable factors.

4.3.1.1.3 Parity

Figure 4.5 shows the parity of mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

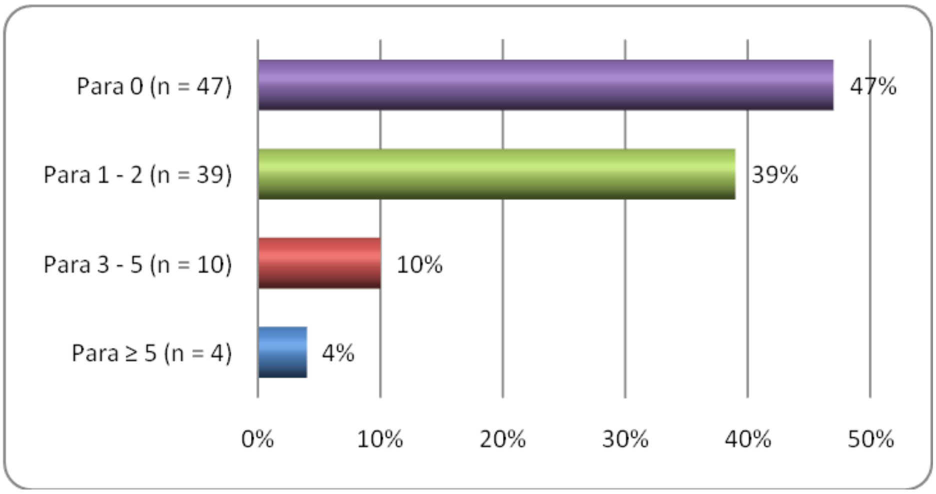

Figure 4.5

Parity (N=100)

The figure shows that 47% (n=47) of the mothers whose babies were admitted to the neonatal unit were delivering for the first time, followed by the mothers who were delivering for the second and third time at 39% (n=39). The mothers who were delivering for the fourth or fifth time accounted for 10% (n=10) of the neonatal admissions, whereas mothers who had delivered more than five times accounted for only 4% (n=4).

Figure 4.6 depicts the neonatal deaths in relation to parity of mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

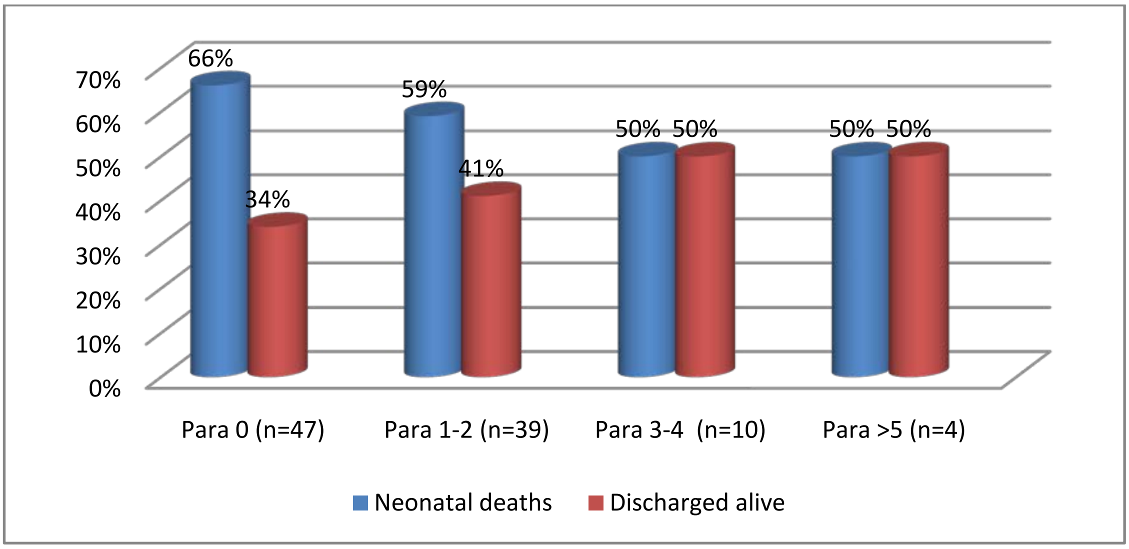

Figure 4.6

Neonatal deaths in relation to parity (N=100)

The neonatal death rate for the para 0 mothers (n=47) was 66% (n=31), for para 1–2 mothers (n=39) it was 59% (n=23), for para 3–4 mothers (n=10) it was 50% (n=5) and for the para above 5 mothers (n=4) 50% (n=2).

In the category of para 0 mothers (n=47), 34% (n=16) of the babies were discharged alive, while in para 1-2 mothers (n=39) 41% (n=16) of the babies were discharged alive.

The results of the study show a link between neonatal death and low parity, as found in the study conducted by Anthony, Jocobusse, Van der Pal-de Bruin, Buitendijk, Zeitlin and the EURO-PERISTAT working group on risk factors in Europe (2009:296), who observed that there was a higher risk of neonatal mortality in primiparae (41-50%) than in multiparae in Belgium.

4.3.1.1.4 Gravidity

Figure 4.7 shows the gravidity of mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

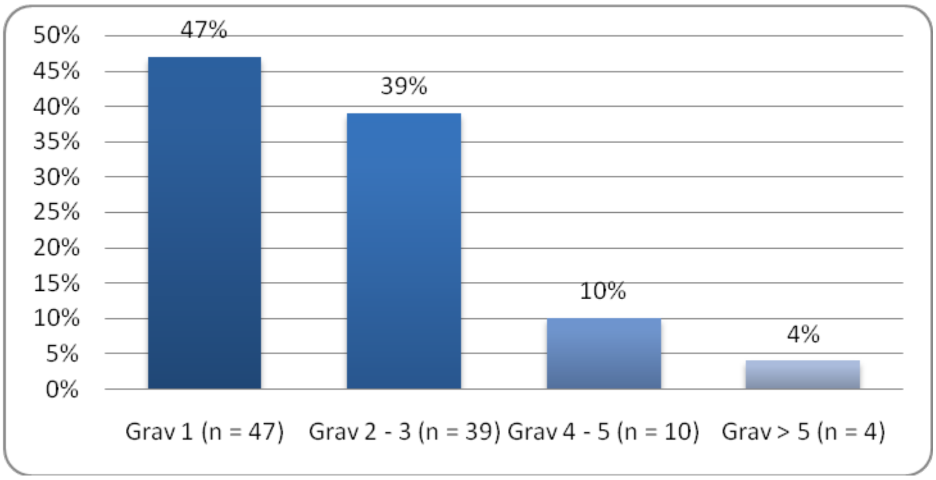

Figure 4.7

Gravidity (N=100)

According to the findings, the gravidity of the mothers whose babies were admitted in the neonatal unit during the months of January to December 2009 correlated with the parity figures. Gravida 1 is equivalent to the parity 0 mothers at 47% (n=47), gravida 2–3 mothers accounted for 39% (n=39), gravida 4–5 mothers at (n=10)10% and gravida >5 mothers for 4% (n=4).

The neonatal death rate for the gravida 1 mothers (n=47) was 66% (n=31), 34% (n=16) of babies being discharged alive; in gravida 2–3mothers (n=39) the neonatal death rate was 59% (n=23), 41% (n=16) of the babies being discharged alive. In the gravida 4–5 mothers (n=10) the neonatal death rate was 50% (n=5) and in the gravida above 5 mothers (n=4) 50% (n=2).

The gravidity of the mothers correlates with the parity. The neonatal deaths also correlate with the gravidity and parity of the mothers. The existing literature (Anthony et al 2009:296) is consistent with the findings of this study.

4.3.1.1.5 Abortion

Table 4.1 shows the history of abortions in the mothers whose babies were admitted to the neonatal unit from January to December 2009.

Table 4.1 History of abortions (N=100)

Abortions	Frequency	Percentage (N=100)
Yes	0	0%
No	87	87%
Unknown	13	13%
Total	**100**	**100%**

The history of abortions is depicted in table 4.1. According to the records, of the 100 mothers whose babies were admitted in the neonatal unit from January to December 2009, 87% (n=87) had never had abortions. The status of the remaining 13% (n=13) was unknown, since there was no record of whether these mothers had had any abortions.

4.3.1.1.6 Stillbirth and neonatal deaths

The records of the 100 mothers whose babies were admitted to the neonatal unit from January to December 2009 showed that 84% (n=84) of mothers had never experienced stillbirths or neonatal deaths. Only 2% (n=2) of the mothers had experienced previous neonatal deaths. In the remaining 14% (n=14) there was no record of either a stillbirth or neonatal death. Their status was therefore indicated as "unknown".

Figure 4.8 depicts the history of stillbirth and neonatal deaths at the first booking of those mothers (N=100) whose babies were admitted to the neonatal unit during the months of January to December 2009.

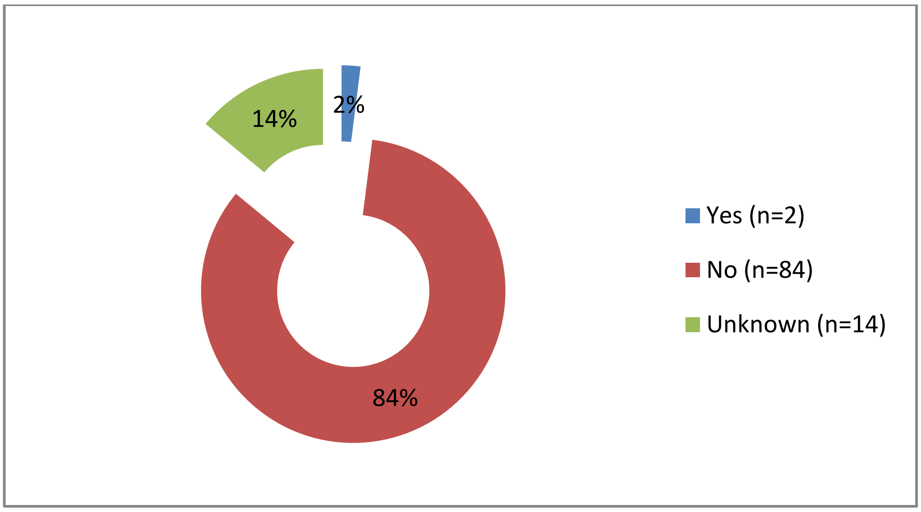

Figure 4.8

Stillbirths and neonatal deaths (N=100)

4.3.1.1.7 Period of neonatal death

Of the two mothers who had experienced previous neonatal deaths, only one indicated that it occurred within seven days of birth. However, there was unfortunately no record of the other neonatal death and when it occurred.

According to the findings, the history of stillbirth did not have any significance for the statistics relating to neonatal deaths, as these mothers who had experienced previously reported neonatal deaths. Their babies were discharged alive.

4.3.1.1.8 Gestational age of previous babies

Figure 4.9 shows the gestational age of the previous babies of those mothers whose babies were admitted in the neonatal unit during the months of January to December 2009.

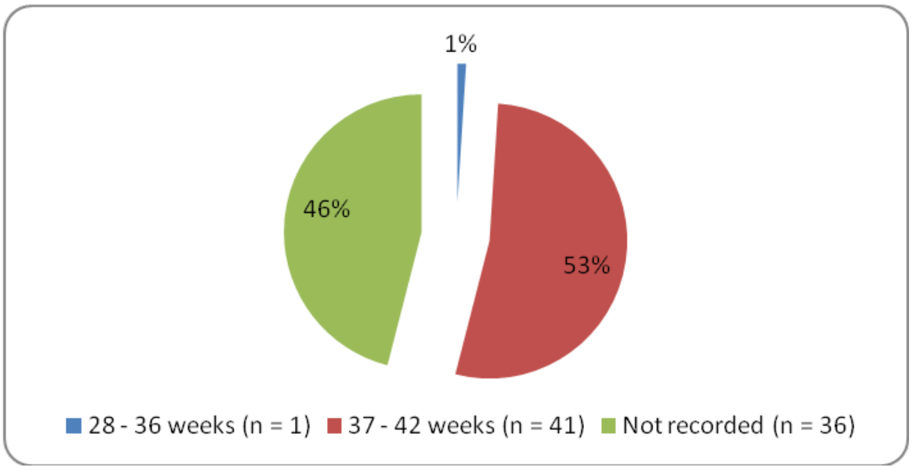

Figure 4.9

Gestational age of previous babies (n=78)

The gestational age of previous babies was checked in the antenatal cards of the booked mothers (n=78). The researcher found that in 46% (n=36) of the cases the gestational ages of the previous babies were not indicated on the antenatal history taking. It was also found that 53% (n=41) of the mothers had a gestational age of between 37 and 42 weeks for the previous pregnancies, which indicated that babies were delivered at term, while the remaining 1% (n=1) delivered between 28–36 weeks, indicating a preterm delivery.

The findings of the study indicated that most of the neonatal deaths (59% (n=24)) occurred in weeks 37-42 of the gestation period. No deaths occurred during weeks 28-36. There was a high neonatal death rate (92% (n=33)) in the mothers where the gestational age of the previous babies was not indicated.

According to the study done by Bakketeig, Jacobsen, Skjaerven, Carneiro and Knudsen (2006:509), there is a tendency for low birth weight to recur, though with lower risk than in cases where low birth weight does not recur.

4.3.1.1.9 Place of delivery of previous babies

Figure 4.10 shows the place of delivery of previous babies of the mothers who were booked.

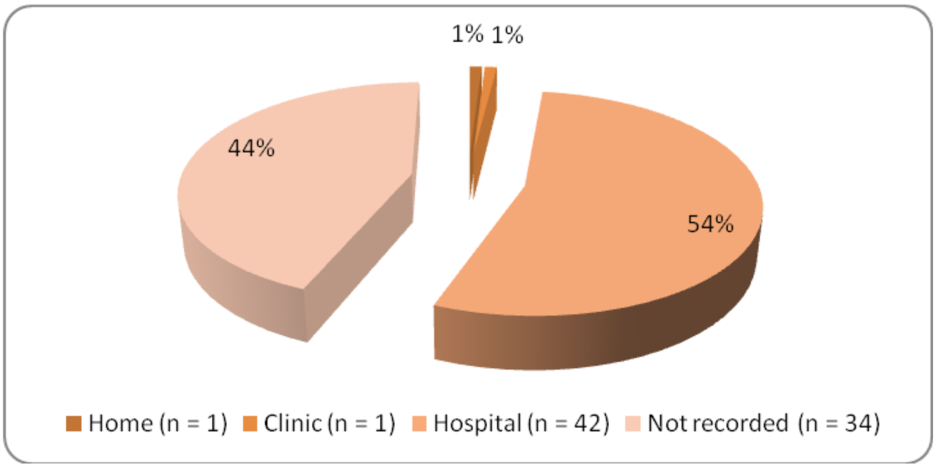

Figure 4.10

Place of delivery of previous babies (n=78)

The data were collected from the antenatal cards of the booked mothers (n=78). The findings showed that 54% (n=42) of the mothers delivered in the hospital while only 1% (n=1) of the mothers either delivered at home or at the clinic. In 44% (n=34) of the women the place where the previous deliveries had taken place was unknown, since this was not indicated on the records.

The findings of Malqvist, Nga, Eriksson, Wallin, Ewald and Persson (2008:195) regarding delivery care utilisation and care-seeking in the neonatal period indicated that most deaths (61%) occurred in the group that received no care at all.

According to this study, it is inconclusive whether the place of delivery has an impact on neonatal deaths, since only one mother had a history of delivering at home.

4.3.1.1.10 Weight of previous babies

Table 4.2 shows the weight of the previous babies of the mothers who were booked.

Table 4.2 Weight of previous babies (n=78)

Weight	**Frequency**	**Percentage (n=78)**
1000 g-2499 g	2	3%
2500 g-4000 g	40	51%
Not recorded	36	46%
Total	**78**	**100%**

Table 4.2 shows a high level of lack of documentation: in 46% (n=36), of the booked mothers (n=78), the weight of the baby was not recorded. This may also be because mothers may not know the birth weight of their babies. Most babies were born with a birth weight of between 2500 g and 4000 g, which accounted for 51% (n=40); only 3% (n=2) of the previous babies weighed between 1000 g and 2499 g. Mothers who previously delivered babies with a recorded birth weight of between 1000 g and 2499 g (n=2) accounted for 50% (n=1) of neonatal deaths, while those weighing 2500 g – 4000 g (n=40) accounted for 58% (n=23) and those not recorded (n=36) for 89% (n=32). This statement means that one mother who had a previous neonatal weight of 1000 g-2499 g had a neonatal death while the one mother who did not have a neonatal death, while out of 40 mothers whose previous babies weighed 2500 g – 4000 g, 23 of the mothers had neonatal deaths and the 36 mothers who did not have any record of the previous weights of their babies, 32 of them experienced neonatal deaths. The weights of those who died are between 2500 g – 4000 g. The statement is based on the weights of the previous babies but not the present babies.

The study conducted in Denmark by Bakketeig et al (2006:510) found that the tendency for low birth weight to recur was associated with reduced early neonatal and infant mortality, especially in mothers of full-term low birth weight babies whose first baby had a birth weight below 2500 g, compared to second births of mothers whose first baby had been of normal size.

4.3.1.1.11 Complications in previous pregnancies

Table 4.3 shows the complications experienced by mothers during previous pregnancies of those mothers who had been booked

Table 4.3 Complications in the previous pregnancies (n=78)

Complication	Frequency	Percentage (n=78)
Hypertension	3	4%
Gestational diabetes	1	1%
Preterm labour	2	3%
Obstetric haemorrhages	1	1%
Premature rupture of membranes	1	1%
Infections	0	0%
Prolonged labour	1	1%
Assisted delivery	0	0%
Others	1	1%
None	30	39%
Not recorded	38	49%
Total	**78**	**100%**

Table 4.3 indicates complications during previous pregnancies which could place the present babies at risk of neonatal complications and death. The data were collected from the records of 78 booked mothers. It is alarming that 49% (n=38) of the files did not record whether the mother had had any complications during previous births or not. In 39% (n=30) of the mothers it was indicated that no previous complications were reported during their previous pregnancies. Hypertension accounted for 4% (n=3) of the complications experienced by mothers during the previous pregnancies, preterm labour for 3% (n=2) and gestational diabetes and other complications, (obstetric haemorrhages, premature rupture of membranes, infections, prolonged labour and assisted deliveries) for only 1% (n=1) respectively.

The results clearly indicate that the previous history of risk factors as indicated in table 4.3 has an important link with neonatal deaths. All mothers with risk factors except for hypertensive disorders and gestational diabetes experienced neonatal deaths in this study: preterm labour resulted in a 67% neonatal death rate (n=1), obstetric haemorrhage in 100% (n=1), premature rupture of membranes in 100% (n=1), prolonged labour in 100% (n=1) and caesarean section in 100% (n=1).

The findings of the study are consistent with studies done by Jehan, Harris, Salat, Zeb, Mobeen, Pasha, McClure, Moore, Wright and Goldenberg (2009:134), who identified the following factors associated with neonatal deaths: gestational age <37weeks (58.5%), birth weight <2000 g (26.1%), caesarean section (36%), meconium-stained fluid (27.3), foul-smelling amniotic fluid (23.8%) and excessive vaginal bleeding during labour (13%).

4.3.1.1.12 Medical history of the mothers

Table 4.4 shows the medical history of the 78 booked mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.4 Medical history of the mothers (n=78)

Medical condition	Frequency	Percentage (N=78)
Cardiac	0	0%
Diabetes	2	3%
Hypertension	2	3%
Kidney disease	0	0%
Epilepsy	0	0%
Tuberculosis	0	0%
Liver disease	0	0%
Allergies	0	0%
Other	0	0%
None	74	67%
Total	**78**	**100%**

The data relating to the medical conditions of the mothers were collected from the antenatal cards of the 78 booked mothers. According to the findings, 3% (n=2) of the mothers suffered from diabetes and 3% (n=2) from hypertension. These mothers were receiving treatment for their condition. Ninety-four percent (n=74) of the mothers had no medical conditions.

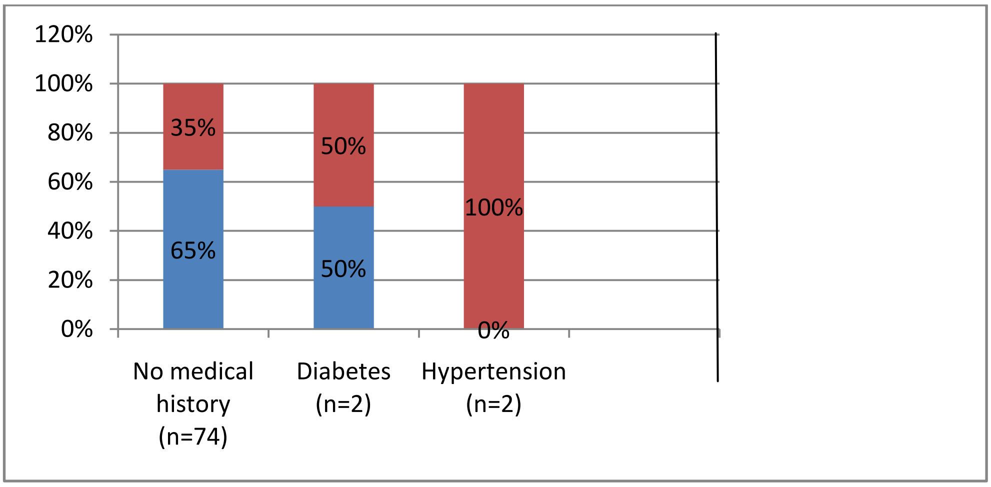

Figure 4.11

Neonatal deaths in relation to previous medical history (n=78)

Of the 74 mothers who had no medical history, 65% (n=48) lost their babies while 35% (n=26) of the mothers were discharged from the neonatal unit with their babies alive.

The two mothers with diabetes indicated that they had also suffered from diabetes during their previous pregnancies. One mother experienced neonatal death and the other was discharged with her baby alive. Both mothers suffering from hypertension had also had hypertension during their previous pregnancies. The mothers suffering from hypertension did not experience neonatal deaths with the present birth.

According to the findings of the study conducted in Taipei by Chen, Wu, Kao, Su and Chen (2009:1042), it was found that recurrent pre-eclampsia seems to be less severe and to have a better perinatal outcome than pre-eclampsia in nulliparas. This is in contrast to the findings in the study by Gonzalez-Gonzalez, Ramirez, Mozas, Melchor, Armas, Garcia-Hernandez, Caballero, Hernandez, Diaz-Gomez, Jimenez, Parache and Bartha (2008:47), who found that the rate of caesarean sections was very high in patients with type 1 (48.8%) and type 2 (41.1%) diabetes respectively. This is more than twice national rate for the general population in Spain (20.3%).

4.3.1.1.13 Lifestyle habits

There was no history of alcohol consumption or smoking in the 78 booked mothers. Three percent (n=2) of the mothers were allergic to fish, 1% (n=1) was allergic to medication and 96% (n=75) of the mothers were not allergic to anything.

In their study of iron deficiency anaemia, cigarette smoking and risk of abruptio placentae in Seattle, Washington, Arnold, Williams, Miller, Qiu and Sorensen (2009:449) found that maternal cigarette smoking during pregnancy results in a 2.4-fold increased risk of abruptio placentae, while early iron deficiency anaemia is associated with high maternal and perinatal morbidity and mortality.

The findings in this study did not show alcohol consumption or smoking as risk factors in neonatal deaths.

4.3.1.1.14 Surgical history

Figure 4.12 shows the surgical history at first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

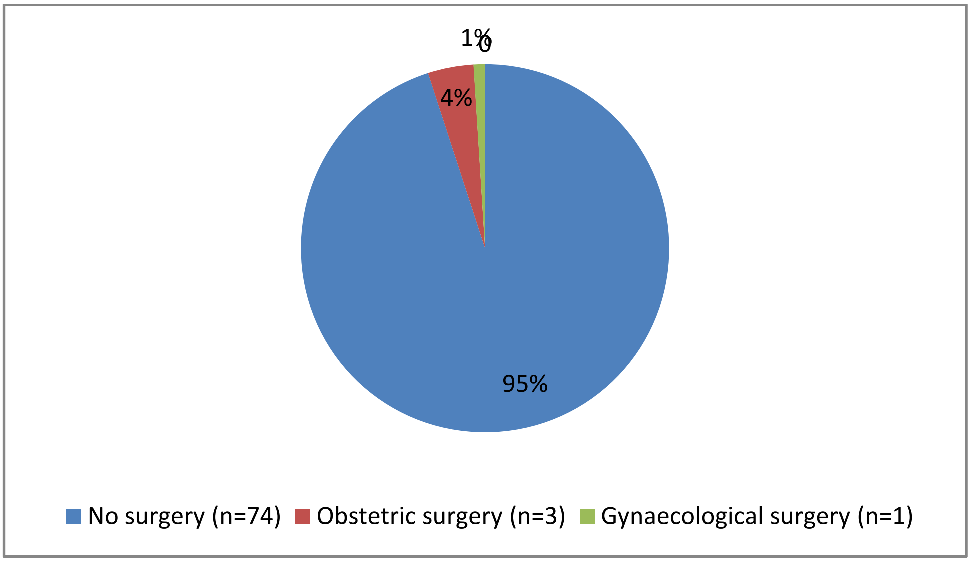

Figure 4.12

Surgical history (n=78)

Data relating to surgical history were collected from the 78 booked mothers. Most of the mothers did not undergo any surgery in their previous pregnancies. These mothers accounted for 95% (n=74) of the findings. Four percent (n=3) had undergone obstetric surgery 1% (n=1) had undergone gynaecological surgery. Of the three mothers who had obstetric surgery, 67% (n=2) experienced neonatal deaths and 33% (n=1) were discharged with the baby alive. The statistics for obstetric surgery were not indicated.

The findings in this study indicate that previous obstetric surgery does have an impact on the pregnancy outcome. This is confirmed by findings in the study conducted by Menacker, MacDorman and Declerq (2010:151,) who found that the neonatal mortality rate is 20% higher for infants delivered by repeat caesarean section compared to infants delivered by vaginal birth after a previous caesarean birth in the 'no indicated risk' group and 29% higher in the low-risk group.

4.3.1.1.15 Family history of the mothers

Table 4.5 shows the family history of those mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.5 Family history of the mothers (n=78)

Medical condition	Frequency	Percentage (N=78)
Cardiac	1	1%
Diabetes and hypertension	3	4%
Hypertension	11	14%
Kidney disease	0	0%
Epilepsy	1	1%
Tuberculosis	0	0%
Liver disease	0	0%
Congenital abnormalities	0	0%
Multiple pregnancy	0	0%
Other	0	0%
None	62	80%
Total	**78**	**100%**

Hypertension is shown to be the leading family medical condition of the mothers at 14% (n=11) followed by a combination of diabetes and hypertension at 4% (n=3). Cardiac conditions and epilepsy accounted for 1% (n=1) respectively. Eighty percent (n=62) of the mothers had no history of family medical conditions.

Only 18% (n=2) of the eleven mothers who reported that they suffered from hypertension actually presented with hypertension when admitted and 67% (n=2) of the mothers with both diabetes and hypertension presented with both diabetes and hypertension.

4.3.1.1.16 Gestational age at first booking

According to the findings shown in figure 4.13, 46% (n=36) of the mothers first attended antenatal care around 17–24 weeks of gestation, followed by 20% (n=16) at 25–28 weeks and 17% (n=13) at 12–16 weeks. Only 3% (n=2) of the mothers first attended antenatal care at 0–11 weeks of gestation and 14% (n=11) started after 28 weeks.

Figure 4.13 shows the gestational age at first booking of mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

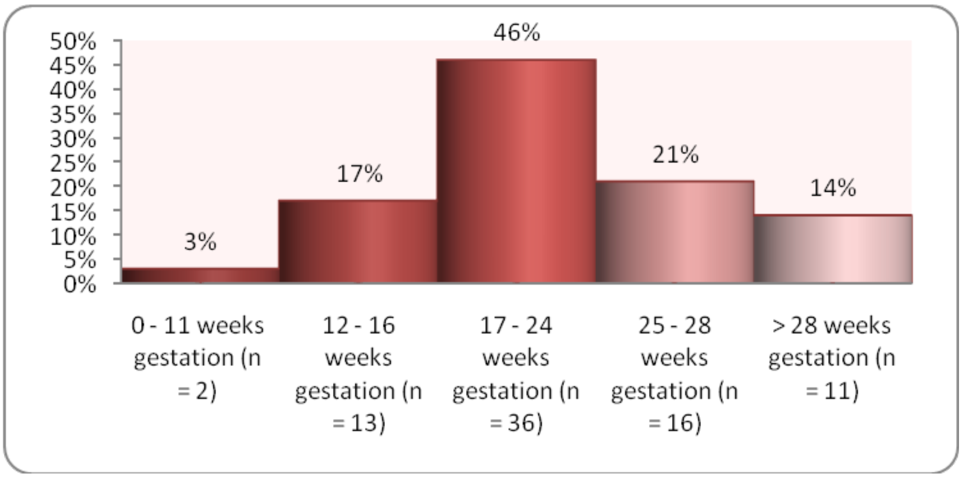

Figure 4.13

Gestational age at first booking (n=78)

The neonatal deaths occurred mostly in mothers who were booked between 17 and 24 weeks of gestation and after 28 weeks of gestation. In the 36 mothers who booked between 17–24 weeks (n=36) and 25–28 weeks respectively (n=16), the neonatal death rate was 69% (n=25, 11). Thirty-one percent (n=11, 5 respectively) of the babies were discharged alive. Sixty-four percent (n=7) of the mothers who booked at a gestational age above 28 weeks (n=11) experienced neonatal deaths and 36% (n=4) of the babies were discharged alive.

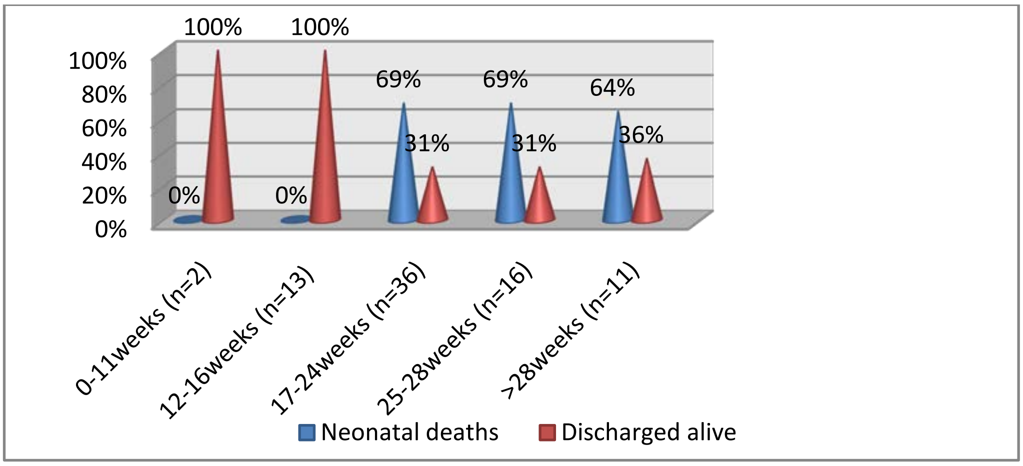

Figure 4.14

Neonatal deaths in relation to gestational age at first booking (n=78)

According to the DoH (2007:20), women should visit the health care provider as soon as they suspect that they may be pregnant, even as early as the first missed menstrual period. A urine test must be done to confirm the pregnancy. Women who present to primary care clinics and are found to be pregnant must be issued with an antenatal card and receive their first visit antenatal care assessment and investigation to assess risk factors.

Kibel et al (2007:320) found that common patient-related avoidable factors are a failure to seek antenatal care, delay in seeking timely medical care and inappropriate responses to danger signs. This statement is supported by Pattinson (2003–2005:15) who indicated that one of the avoidable patient-related factors is a failure to initiate antenatal care at all.

4.3.1.1.17 Foetal movements

In figure 4.15 it is indicated that in 90% (n=70) of the 78 booked mothers, there was no record of when the mother first felt foetal movements. Mothers who first felt foetal movements at 16–19 weeks represent only 1% (n=1) of the mothers who were booked, while those who first felt foetal movements at 20–24 weeks accounted for 5% (n=4) and those who first felt foetal movements above 24 weeks for 4% (n=3).

Figure 4.15 shows the foetal movements reported by the booked mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

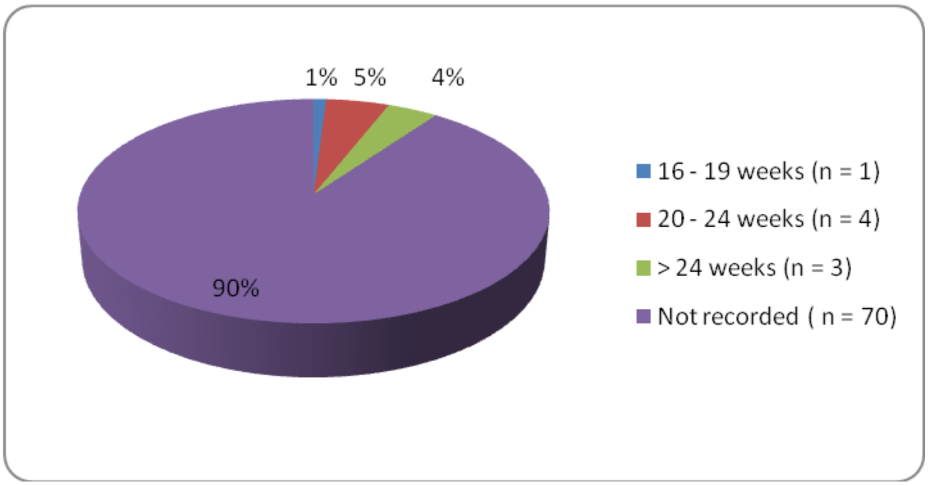

Figure 4.15

Foetal movements (n=78)

Of the 70 mothers who did not have any record of foetal movement, 59% (n=41) experienced neonatal deaths while 41% (n=29) of the babies were discharged alive.

In the study conducted by Sinha, Sharma, Nallaswamy, Jayagopal and Bhatti (2007:43), it was found that in intrauterine growth restriction and interventional deliveries are more common among women presenting with reduced foetal movements.

4.3.1.2 Physical examination during the first antenatal visit

The physical examination conducted on the mothers (n=78) during the first antenatal visit was analysed.

As stated in the DoH (2007:20), the general appearance of the woman is assessed as far as it points to good or poor health. A general examination is done including weight, height, and heart rate, colour of mucous membranes, blood pressure, oedema, and palpation for lymph nodes.

A systematic examination of teeth, breasts, thyroid, heart and lungs is conducted. Where no staff member in the antenatal clinic is trained to perform the heart and lung examination, this may be omitted provided the pregnant woman has no history or symptoms of heart or lung disease. It is common practice to refer women with dental problems to a dentist or dental therapist. A gynaecological examination should be undertaken, including an inspection of the pregnant uterus, a measurement of the SFH in centimetres and listening to the foetal heartbeat after 26 weeks (DoH 2007:20).

4.3.1.2.1 Sonar done for baseline information

According to the findings, sonars were conducted on 8% (n=6) of the 78 mothers who attended antenatal clinics. No sonars were conducted on the remaining 92% (n=72).

Table 4.6 shows the mothers on whom sonars were conducted for baseline information at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.6 Mothers on whom sonars were conducted for baseline information (n=78)

Sonar	Frequency	Percentage (N=78)
Yes	6	8%
No	72	92%
Total	**78**	**100%**

The reason why sonars are conducted in such a small percentage of cases may be that, according to the DoH (2007:23), an ultrasound scan for an estimate of gestational age should be requested for women who are unsure about or do not know the date of the last normal menstrual period, with an SFH measurement less than 24 cm, in order to give a reasonably accurate estimate of gestational age before 24 weeks of gestation. According to the DoH (2007:23), this is less reliable after 24 weeks.

The researcher did not find that the conducting of sonars was of any significance to the incidence of neonatal deaths.

4.3.1.2.2 Height of the mothers

The findings showed that 46% (n=36) of the booked mothers were more than 150 cm tall. The height of the mother was not recorded in the remaining 54% (n=42) cases.

Of the 36 mothers taller than 150cm, 56% (n=20) experienced neonatal deaths, compared to a 69% (n=29) death rate in the mothers whose height was not recorded.

Table 4.7 depicts the height of mothers at the first booking (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.7 Height of mothers (n=78)

Height	Frequency	Percentage(N=78)
<150cm	0	0%
>150cm	36	46%
Not recorded	42	54%
Total	**78**	**100%**

The findings are consistent with the study done in India by Khatib, Zahiruddin, Gaidhane, Waghmare, Srivatsava, Goyal, Zodpey and Johrapurkar (2009:443), who found that weight is more frequently measured in pregnant women (93%) than height (47.9%).

According to the results of the study done by Chhabra, Sharma and Tupil (2006:568) a height of <140 cm was associated with caesarean delivery or forceps delivery. However, this could not be confirmed in this study, as there were no mothers shorter than 140 cm.

4.3.1.2.3 Weight of the mothers at the first antenatal visit

The researcher found that 73% (n=57) of the booked mothers weighed between 51 and 70 kg at the first antenatal visit; 22% (n=17) weighed more than 71 kg and only 1% (n=1) weighed below 50 kg. In 4% (n=3) of the cases the mother's weight was not recorded.

Table 4.8 Weight at the first antenatal visit (n=78)

Weight	Frequency	Percentage
<50k g	1	1%
51-70 kg	57	73%
≥71 kg	17	22%
Not recorded	3	4%
Total	**78**	**100%**

Of the 57 mothers who weighed between 51 and 70 kg, 61% (n=35) reported neonatal deaths while 39% (n=22) of babies were discharged alive. Of the 17 mothers who weighed more than 71 kg, 65% (n=11) experienced neonatal deaths, while 35% (n=6) of the babies were discharged alive, and the three mothers who did not have record of their weight had 67% (n=2) neonatal deaths while 33% (n=1) of the babies were discharged alive.

Figure 4.16 shows neonatal deaths in relation to the weight of those mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

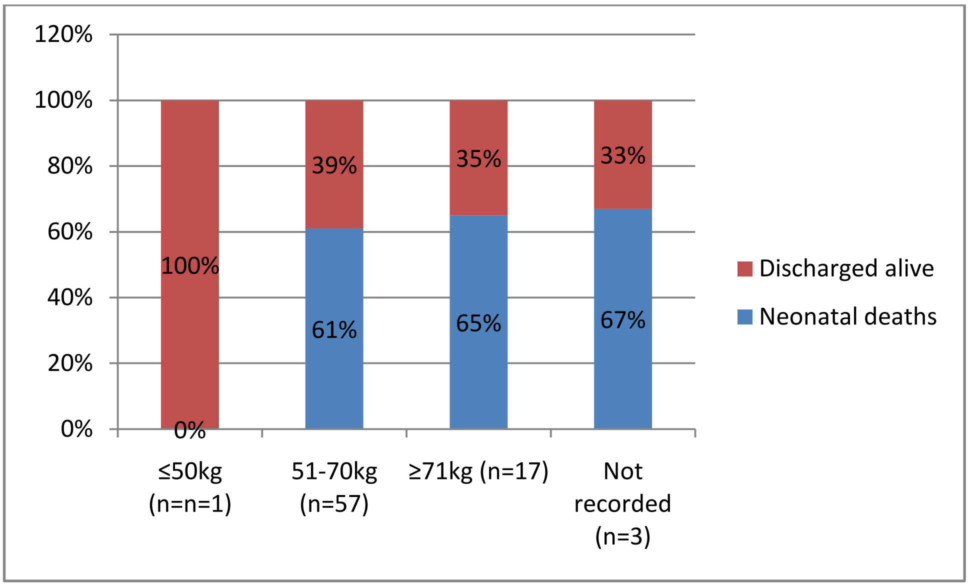

Figure 4.16

Neonatal death in relation to maternal weight (n=78)

The findings of this study are comparable to those of the study conducted by Sarkar, Cooley, Donnelly, Walsh, Collins and Geary (2007:882) in Ireland, who found a significantly higher neonatal intensive care unit admissions rate in obese mothers (8.6%) than in those conforming to the normal body mass index (2.2%).

The findings of Chhabra et al (2006:568) contrast with the results of this study in that they found that perinatal death was more common in cases where the mother weighed <40 kg (12.5%) than where the maternal weight was >50 kg (4.0%).

4.3.1.2.4 Blood pressure measurements

Figure 4.17 shows the blood pressure measurements at the first booking of those mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

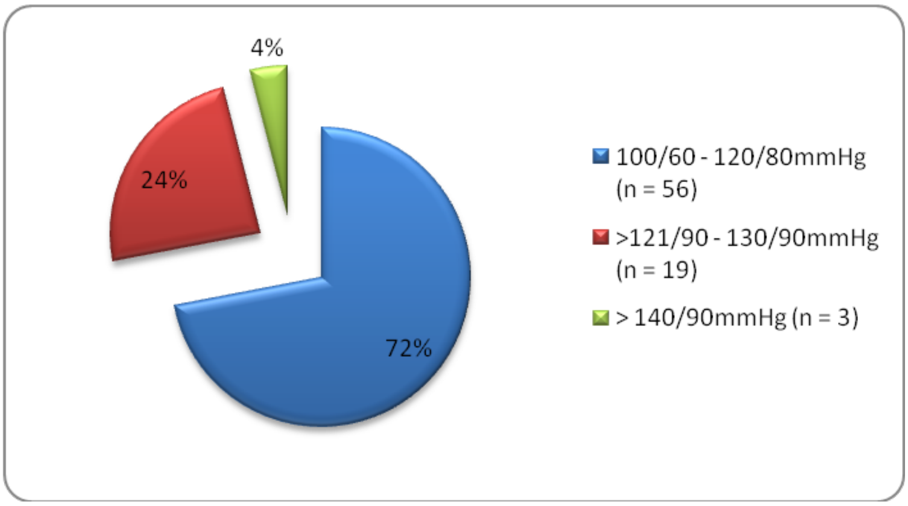

Figure 4.17

Blood pressure measurements at first visit (n=78)

The findings of the study were that 72% (n=56) of booked mothers had normal blood pressure of between 100/60–120/80 mmHg, 24% (n=19) had a slightly elevated blood pressure of between 121/80–130/90 mmHg and only 4% (n=3) had a blood pressure of above 140/90 mmHg.

Of the 56 mothers whose blood pressure was normal, 66% (n=37) experienced neonatal deaths, the babies being discharged alive 34% (n=19) of the cases. Fifty-eight percent (n=11) of the mothers who presented with blood pressure of 121/90–130/90 mmHg (n=19) experienced neonatal deaths, the babies being discharged alive in 42% of cases (n=8). There were three mothers with blood pressure of ≥140/90 mmHg, but only 33% (n=1) of these mothers experienced neonatal deaths. In the remaining 67% (n= 2) the babies were discharged alive.

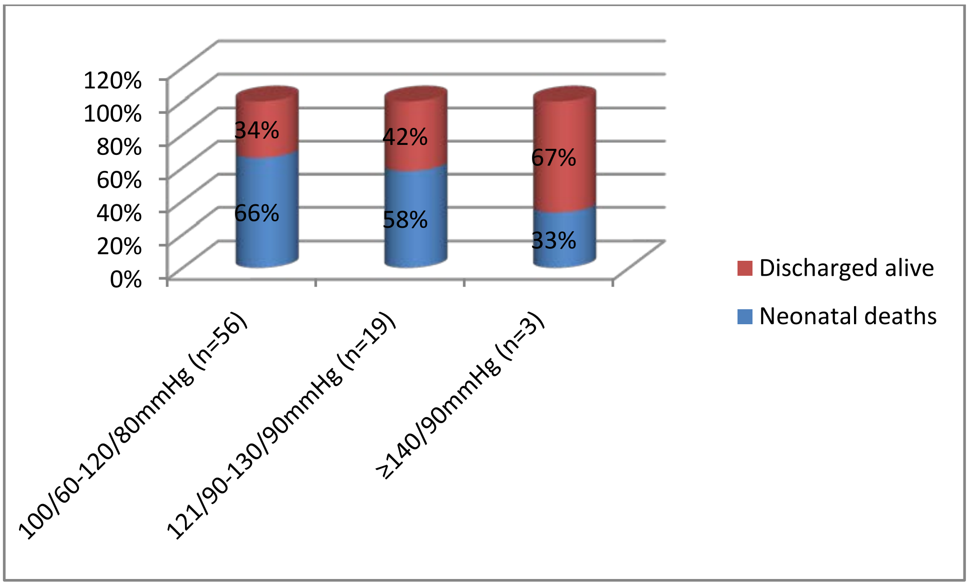

Figure 4.18

Neonatal deaths in relation to maternal blood pressure (n=78)

As indicated in section 4.3.1.1.12, recurrent pre-eclampsia appears to have a better perinatal outcome than pre-eclampsia in nulliparas (Chen et al 2009:1042).

A comparison of height, weight and blood pressure shows that height (46% (n=36)) is not assessed as often as weight 96% (n=75) and blood pressure 100% (n=100). These findings are consistent with the study conducted by Khatib et al (2009:440) who found that during antenatal care, the weight of pregnant women was measured in 92.3% of cases, height in 47.9% and blood pressure in almost all cases (98.9%).

4.3.1.2.5 Urine analysis

Table 4.9 shows the urine analysis during the first antenatal visit of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.9 Urine analysis (n=78)

Urine analysis	Frequency	Percentage (n=78)
Protein only	5	6%
Protein and glucose	1	1%
Protein and blood	1	1%
Blood only	3	5%
Protein, blood and ketones	1	1%
Leucocytes only	2	3%
Leucocytes and blood	1	1%
Normal	64	82%
Total	**78**	**100%**

The researcher found that in 82% (n=64) of cases the urine was normal. In 6% (n=5) only protein was found; protein and glucose were found in 1% (n=1), protein and blood in 1% (n=1), protein, blood and ketones in 1% (n=1), blood only in 5% (n=3), leucocytes only in 3% (n=2), and leucocytes and blood in 1% (n=1).

Khatib et al (2009:440) found that urine was tested in 86.3% of the pregnant women in their study, which correlates with the findings in this research as the urine of all pregnant women attending the antenatal clinic was tested.

4.3.1.2.6 Condition of teeth

The table 4.10 indicates the condition of the teeth in the assessment of the pregnant women in the study.

Table 4.10 Condition of teeth (n=78)

Condition of teeth	Frequency	Percentage
Normal	65	83%
Dental caries	3	4%
Not recorded	10	13%
Total	78	**100%**

Dental caries was recorded in 4% (n=3) of the 78 mothers booked, 83% (n=65) having healthy teeth. The condition of the teeth was not recorded in 13% (n=10) of the cases.

The incidence of neonatal death among the mothers who presented with dental caries (n=3), (i.e. 67% (n=2)) and healthy teeth (n=65), (i.e. 62% (n=40)) was lower than that among the mothers with no record (n=10) of the condition of their teeth (70% (n=7)).

The researcher did not find any literature relating to the condition of teeth in pregnancy outcomes.

4.3.1.2.7 Pallor

Figure 4.19 shows the assessment of pallor at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

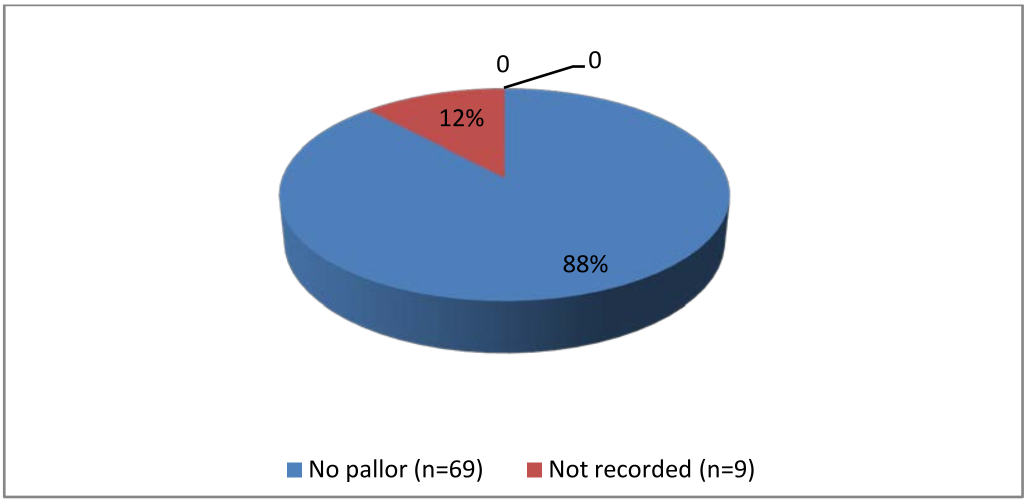

Figure 4.19
Pallor (n=78)

Of the mothers who were booked (n=78), 88% (n=69) displayed no pallor, while in 12% of the cases (n=9) it was not recorded whether the mothers presented with pallor or not.

The researcher found that 71% (n=49) of the mothers who displayed no pallor (n=69), experienced neonatal deaths, compared to 78% (n=7) of mothers (n=9) whose pallor (or absence thereof) was not recorded.

Arnold et al (2009:446) found that maternal iron deficiency anaemia in early pregnancy was associated with a 3.60-fold increase risk of abruptio placentae, which increases the risk of unfavourable pregnancy outcomes. Chen et al (2007:124) indicate that if there is inadequate prenatal care, there are increased risks of neonatal death when pregnancies are complicated by anaemia, cardiac diseases, lung diseases, chronic hypertension, diabetes and other conditions.

4.3.1.2.8 Condition of the thyroid

The thyroid was found to be normal in 86% (n=67) of booked mothers (n=78) at the first antenatal visit. In 14% (n=11) of mothers there was no record of thyroid assessment or examination.

Sixty-one percent (n=41) of the mothers with normal thyroid function (n=67) experienced neonatal deaths, as did 73% (n=8) of the mothers whose thyroid assessment or examination was not recorded. (n=11).

According to Arnold et al (2009:125), inadequate prenatal care is associated with higher neonatal mortality even in the absence of antenatal high-risk conditions as indicated in the findings of this study.

4.3.1.2.9 Condition of the breasts

The condition of the breast was soft in 85% (n=66) of the booked mothers (n=78) and the nipples were recorded as prominent in 5% (n=4) of the cases. In 10% (n=8) of the mothers there was no record of the condition of the breasts at the first antenatal visit.

Table 4.11 Condition of breasts (n=78)

Condition of breasts	Frequency	Percentage
Soft	66	85%
Prominent nipples	4	5%
Not recorded	8	10%
Total	**78**	**100%**

According to Khatib et al (2009:440) in their study on predictors for antenatal services and pregnancy outcomes in a rural area in India, it was found that examination of the breasts was done in 12.2% of pregnant women during antenatal care. These statistics are much lower than those in this study. Almost all the pregnant mothers who attended the antenatal clinic (90% (n=70) were subjected to a breast examination).

4.3.1.2.10 Presence of oedema

Figure 4.20 depicts the presence of oedema at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

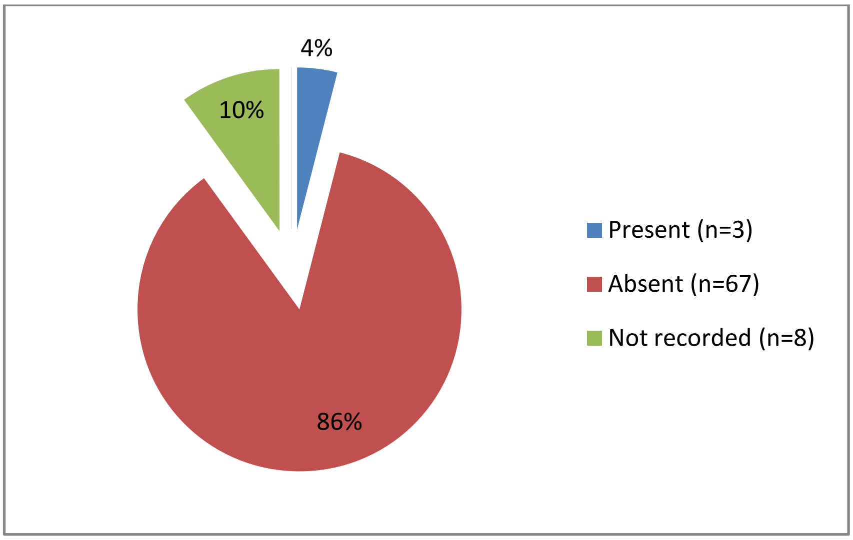

Figure 4.20

Presence of oedema (n=78)

Oedema was assessed in the booked mothers (n=78) and was found to be present in 4% (n=3) of the cases at the first antenatal visit. Of the three cases, 67% (n=2) the oedema was found on the legs and in 33% (n=1) on the face. There was no oedema in

86% (n=67) of the cases while in 10% (n=8), there was no record of oedema. According to the records the oedema was not associated with hypertensive conditions, but other conditions were not excluded.

Of the mothers who presented with oedema (n=3), 33% (n=1) had experienced a neonatal death, while 63% (n=67) of mothers who had no oedema experienced neonatal deaths and where the oedema was not recorded (n=8), 75% (n=6) experienced neonatal deaths. These findings are consistent with the results of Chen et al (2007:125) as indicated in section 4.3.1.2.7.

4.3.1.2.11 Examination of the abdomen

At the first antenatal visit the abdomen was found to be normal in 89% (n=69) of the mothers booked (n=78.). In 11% (n=9) the examination of the abdomen was not recorded. Table 4.12 reflects these statistics.

Table 4.12 Examination of the abdomen (n=78)

Examination of abdomen	Frequency	Percentage
Normal	69	89%
Not recorded	9	11%
Total	**78**	**100%**

The findings in this study are comparable with the findings of Khatib et al (2009:440) who established that the abdomen was examined in 91.6% of pregnant women during antenatal care. The abdominal examination was done in 89% (n=69) of the booked mothers in this study.

4.3.1.2.12 Examination of the lungs

Figure 4.21 depicts the examination of the lungs at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

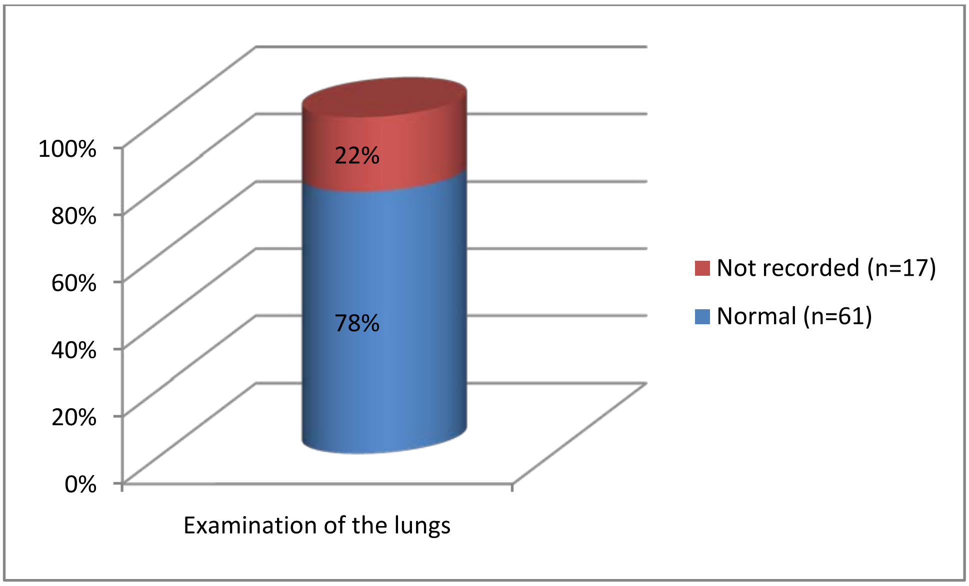

Figure 4.21

Examination of the lungs (n=78)

The lungs of 78% (n=61) of the booked mothers (n=78) were examined and found to be normal at the first antenatal visit. In 22% (n=17), the examination of the lungs was not recorded.

Eighty-two percent (n=14) of the mothers whose lungs were not examined (n=17) experienced neonatal deaths. Of those who had normal lungs (n=67) when examined, 52% (n=35) experienced neonatal deaths.

These findings are consistent with the results of the study done by Chen et al (2007:122), as indicated in section 4.3.1.2.7 regarding the role of inadequate prenatal care in the increased risk of neonatal death when pregnancy is complicated by high risk factors, e.g. lung disease.

4.3.1.2.13 Respiratory rate

Fifty-nine percent (n=46) of the booked mothers (n=78) had a normal respiratory rate. The respiratory rate was not recorded in 41% (n=32).

4.3.1.2.14 Pulse rate

In 64% (n=50) of the booked mothers (n=78) the pulse rate was between 60–100 beats per minute. In 36% (n=28) of the mothers the pulse rate was not recorded.

4.3.1.2.15 Symphysis fundal height measurements

The symphysis fundal height is used to estimate gestational age after 24 weeks if the dates of the last menstrual period are unknown or incorrect, in the case of a normal singleton pregnancy. The measured SFH is plotted onto the 50thpercentile line on the SFH graph, allowing the corresponding gestational age to be read from the graph as required by the DoH (2007:23).

In figure 4.22 the symphysis fundal height of the booked mothers (n=78) at their first antenatal visit was between the 10th and 90th percentile in the majority of cases (83% (n=65). Only 1% (n=1) of SFH measurement was above the 90th percentile and SFH measurements below the 10th percentile accounted for 8% (n=6). Eight percent (n=6) of the SFH measurements were not recorded.

Figure 4.22 depicts the fundal height measurements at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

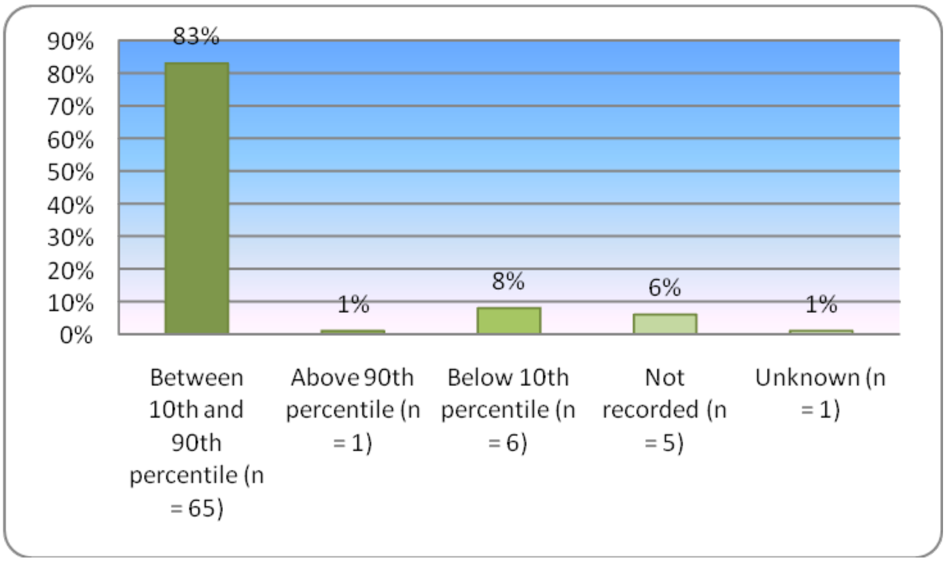

Figure 4.22

Symphysis Fundal Height Measurement (n=78)

Of the 65 mothers whose SFH measurements were between the 10th and the 90th percentile, 62% (n=40) experienced neonatal deaths; thus 38% (n=25) of the mothers were discharged with their babies alive. One mother (n=1) who had an SFH above the 90th percentile experienced a neonatal death, while the mothers whose SFH was below the 10th percentile (n=6) accounted for 50% (n=3) of the neonatal deaths.

4.3.1.3 Investigations conducted

According to the standard of the DoH (2007:26), the following investigations should be done during the first antenatal visit: syphilis serology, i.e. rapid plasma regain, Wasserman's reaction, venereal disease research laboratory, Rhesus (D), blood group, haemoglobin level, human immune virus serology and urine dipstick testing for protein and glucose (DoH 2007:26).

4.3.1.3.1 Rapid plasma regain (RPR) or venereal disease research laboratory (VDRL) results

From the findings, only 1% (n=1) of the booked mothers (n=78) proved to be venereal disease research laboratory positive. The mother was treated in accordance with the national guidelines. Seventy-eight percent (n=61) of mothers were venereal disease research laboratory negative. The results were not recorded, 21% (n=16) cases.

Table 4.13 Venereal disease research laboratory results (n=78)

Venereal disease research laboratory	Frequency	Percentage (n=78)
Positive	1	1%
Negative	61	78%
Not recorded	16	21%
Total	**78**	**100%**

The one mother who was venereal disease research laboratory positive experienced a neonatal death while 61 of the venereal disease research laboratory negative mothers, (59% (n=36) experienced neonatal deaths, 41% (n=25), of the babies being discharged alive. In the mothers whose results were not known (n=16), 81% (n=13) experienced neonatal deaths while in 19% (n=3) of the cases, the babies were discharged alive.

Figure 4.23 shows the relationship between the venereal disease research laboratory and the neonatal deaths.

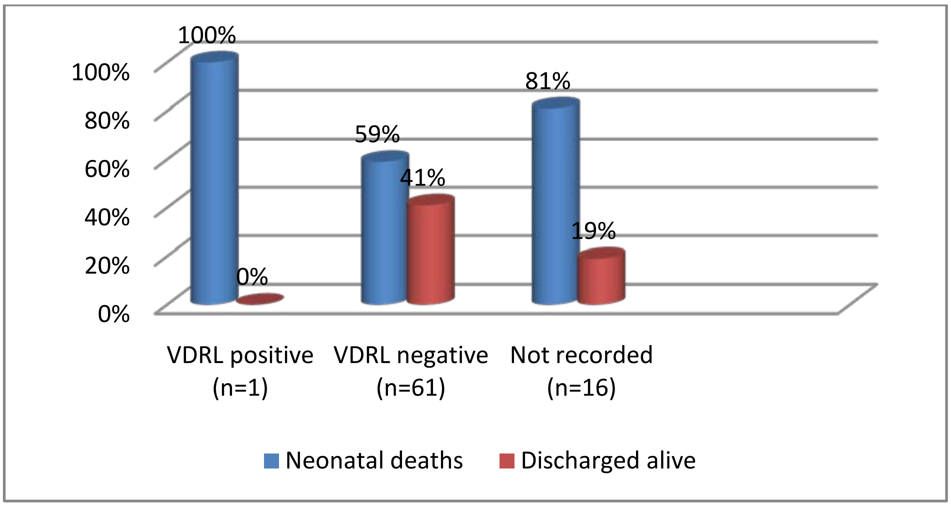

Figure 4.23

Neonatal deaths in relation to maternal venereal disease research laboratory (n=78)

According to Watson-Jones, Oliff, Terris-Prestholt, Changalucha, Gumodoka, Mayaud, Semakafu, Kumaranayake, Gavyole, Mabey and Hayes (2005:934), in their study of antenatal syphilis screening in Tanzania, it was found that 49% of women with untreated high-titre syphilis experienced an adverse pregnancy outcome compared with 11% of uninfected women. When the syphilis was treated during antenatal care, the stillbirths and low birth-weight rates were reduced to rates similar to those for uninfected women. The findings in this study tally with those in the above-mentioned study.

4.3.1.3.2 Rhesus factor

Of the booked mothers (n=78), the researcher found that 74% (n=58) of the mothers were Rhesus positive and 4% (n=3) were Rhesus negative. Twenty-two percent (n=17) of the Rhesus results were not placed on file.

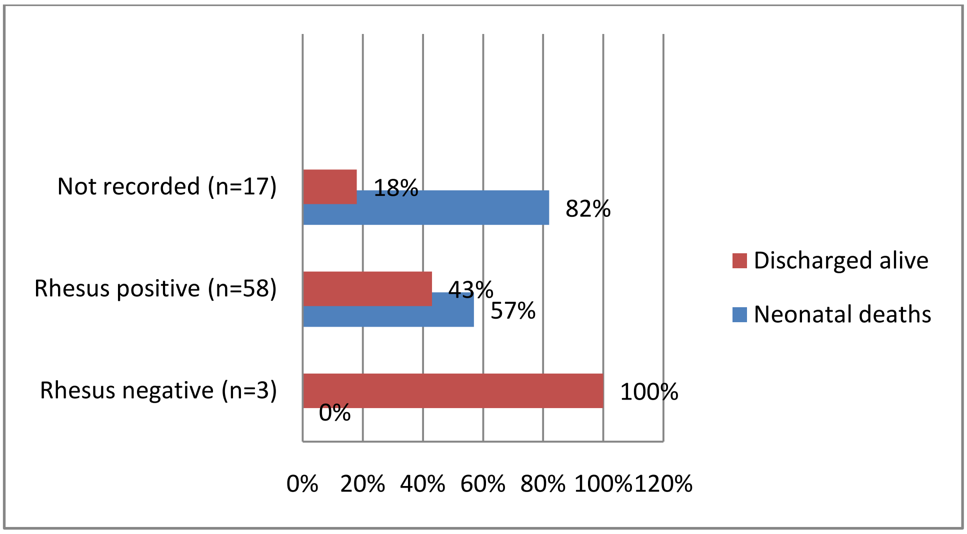

Figure 4.24

Neonatal deaths in relation to maternal Rhesus factor (n=78)

Of the 58 mothers who were Rhesus positive, 57% (n=33) experienced neonatal deaths while in 43% (n=25) of cases the babies were discharged alive. Of the 17 mothers whose results were not recorded, 82% (n=14) experienced neonatal deaths and in the remaining 18% (n=3) of cases the babies were discharged alive.

The researcher did not find research material relating the Rhesus factor to neonatal deaths.

4.3.1.3.3 Haemoglobin levels

Figure 4.25 depicts the haemoglobin levels at the first booking of those mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

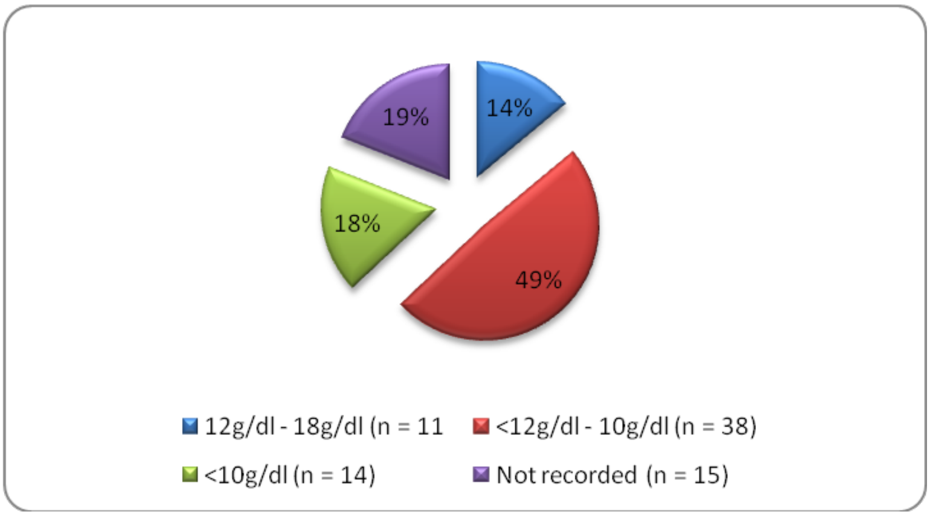

Figure 4.25
Haemoglobin levels at the first antenatal visit (n=78)

Figure 4.25 shows that 49% (n=38) of the mothers had haemoglobin levels between 10 grams/deciliter (g/dl) and 12 g/dl, while 18% (n=14) of the mothers had a haemoglobin level lower than 10 g/dl. In only 14% (n=11) of cases the haemoglobin levels were reported to be between 12 g/dl–18 g/dl. In 19% (n=15) there was no record of the haemoglobin levels.

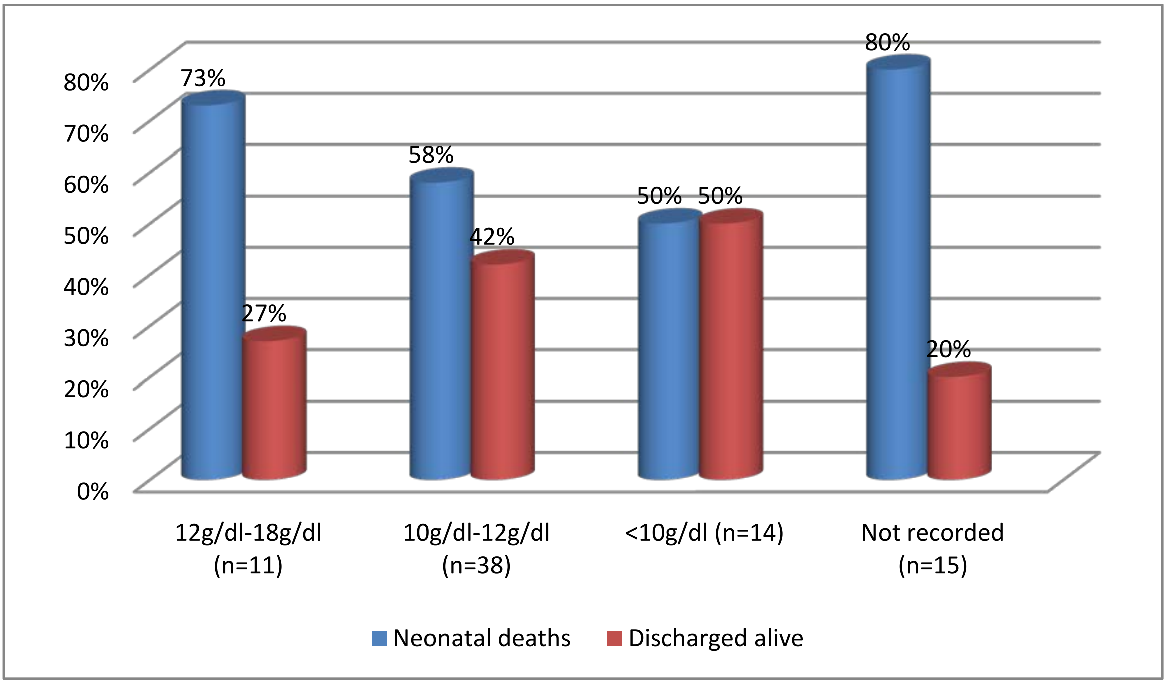

Figure 4.26
Neonatal deaths in relation to maternal haemoglobin levels (n=78)

Seventy-three percent (n=8) of the 11 mothers with a haemoglobin level of 12 g/dl–18 g/dl experienced neonatal deaths and 27% (n=3) of the babies were discharged alive.

Of the 38 mothers with a haemoglobin level of between 10 g/dl–12 g/dl, 58% (n=22) experienced neonatal deaths and 42% (n=16) of the babies were discharged alive. Of the others with a haemoglobin level of below 10 g/dl (n=14), 50% (n=7) experienced neonatal deaths and 50% (n=7) of the babies were discharged alive. Of the mothers whose haemoglobin levels were not recorded (n=15), 80% (n=12) experienced neonatal deaths and 20% (n=3) of the babies were discharged alive.

The findings of the study contrast with the results of the study done by Jehan et al (2009:132) which found that no neonatal deaths occurred in mothers with a haemoglobin level of above 11 g/dl.

4.3.1.3.4 HIV results

According to Kak, Chitsike, Luo and Rollins (2006:113), over a half a million newborns are infected with HIV in sub-Saharan Africa through mother-to-child transmission each year.

Figure 4.27 depicts the HIV results at the first booking of the mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

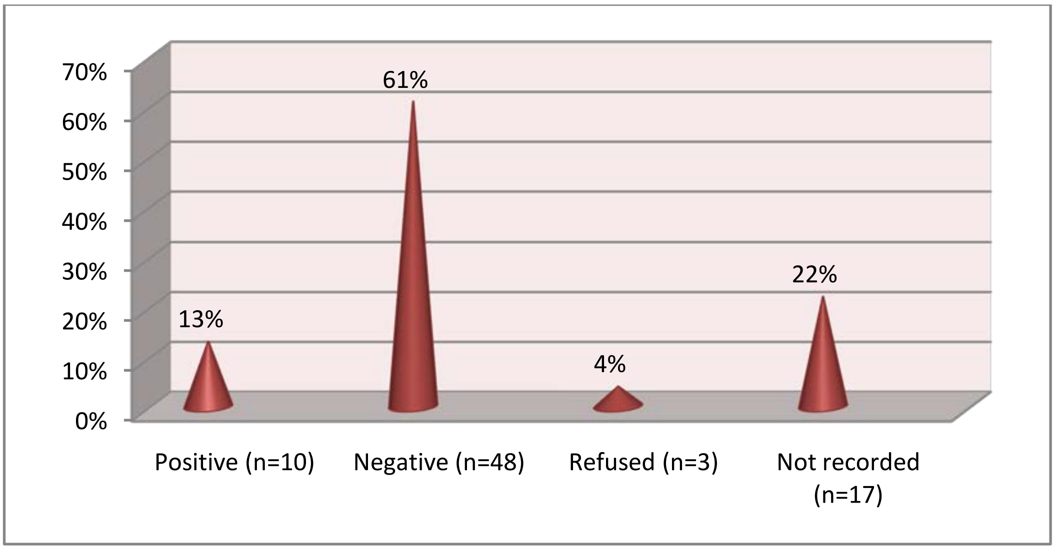

Figure 4.27

HIV results at the first antenatal visit (n=78)

During the study, the researcher found that 61% (n=48) of the mothers were HIV negative, 13% (n=10) were HIV positive, 4% (n=3) refused to be tested for HIV, and in 22% (n=17) the HIV results were not recorded.

Of the 48 mothers who tested negative for HIV, 52% (n=25) experienced neonatal deaths and 48% (n=23) of the babies were discharged alive. Of the ten mothers who were HIV positive, 60% (n=6) had neonatal deaths and 40% (n=4) of the babies were discharged alive. All the mothers who refused to be tested (100% (n=3)) experienced neonatal deaths, while 88% (n=15) of the mothers who did not have records of the HIV results (n=17), experienced neonatal deaths, and 12% (n=2) of the babies were discharged alive.

Figure 4.28 shows the neonatal deaths in relation to the maternal HIV results of mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

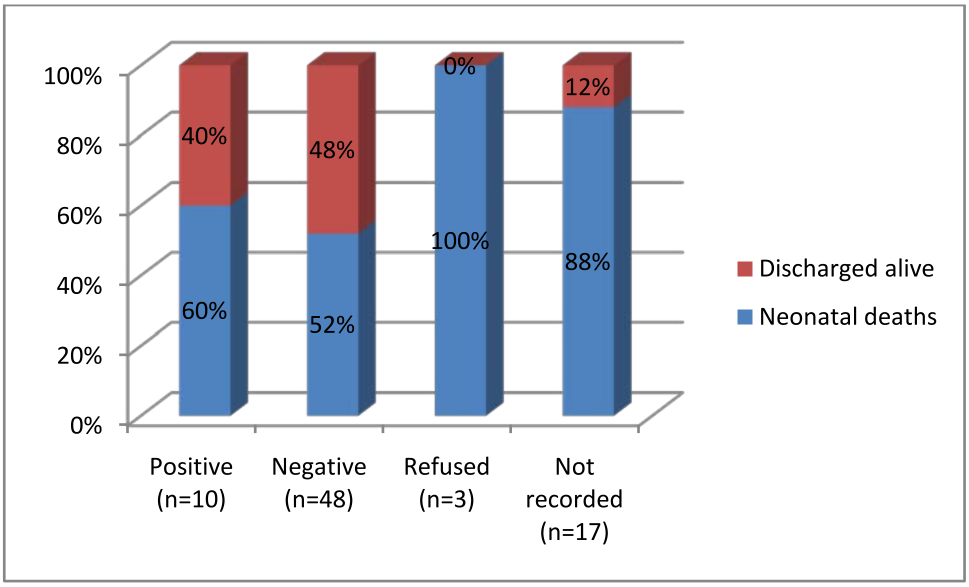

Figure 4.28

Neonatal deaths in relation to maternal HIV status (n=78)

Of the mothers who tested HIV positive (n=10), 60% (n=6) were on mono-therapy and 40% (n=4) on dual therapy. Fifty percent (n=3) of mothers who were on mono–therapy experienced neonatal deaths and 50% (n=3) of the babies were discharged alive. The mothers who were on dual therapy (n=4) experienced neonatal deaths in 75% (n=3) of cases and 25% (n=1) of the babies were discharged alive.

According to Bodkin, Klopper and Langley (2006:735) in their study of the comparison between HIV positive and negative pregnant women in a public sector hospital in South Africa, it was found that HIV positive pregnant women were more likely to have intrauterine growth restriction, a greater risk (4.72% versus 0%,) of delivering prematurely at 37.92 weeks versus 38.51 weeks, and of delivering neonates weighing less than 2969.98 g versus 3138.43 g than HIV negative pregnant women. The low birth weight increases the risk of neonatal death.

Kak et al (2006:114) in *Opportunities for Africa's Newborns*, state that maternal HIV affects newborn survival by causing an increased risk of stillbirths and neonatal deaths. Newborns with HIV positive mothers are more likely to have an LBW, be born preterm and have low Apgar scores, placing them at greater risk of death.

These studies are consistent with the findings in this research.

4.3.1.4 *Supplementation and immunisation*

The medication given to all pregnant women is: ferrous sulphate tablets 200 mg daily, to prevent anaemia, calcium tablets 1000 mg daily, to prevent complications of pre–eclampsia and folic acid tablets 5 mg daily to prevent neural tube defects. In addition, tetanus toxoid immunisation is given routinely to all pregnant women to prevent neonatal tetanus as required by the DoH (2007:26).

Table 4.14 shows the supplementation and immunisation given at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.14 Supplementation and immunisation (n=78)

	Frequency		Percentage
Supplementation	Yes	77	99%
	No	0	0%
	Not recorded	1	1%
	Total	**78**	**100%**
Immunisation	Yes	72	92%
	No	2	3%
	Not recorded	4	5%
	Total	**78**	**100%**

Of the 78 mothers who were booked, 99% (n=77) were given supplements during their first antenatal visit. Only in a small percentage (1% (n=1)) was no record of supplementation kept.

Ninety-two percent (n=72) of the booked mothers (n=78) were immunised during their first visit and 3% (n=2) were not immunised. There was no record of immunisation in 5% (n=4) of the cases.

Of the 77 mothers who received supplementation, 62% (n=48) experienced neonatal deaths. In the one case where there was no record of supplementation (n=1), that mother experienced a neonatal death (100% (n=1). Mothers who were immunised (n=72) experienced 60% (n=43) neonatal deaths, mothers who were not immunised (n=2), 100% (n=2); likewise, where there was no record of immunisation (n=4) 100% (n=4) experienced neonatal deaths.

The results of this study are consistent with the findings of the study conducted by Khatib et al (2009:443) who state that 80% of the pregnant women attending the antenatal services received the minimum recommended doses of iron preparations and tetanus toxoid injection.

The findings of this study showed a link between lack of supplementation or immunisation and an increased risk of neonatal death.

In their study of iron and folic acid supplementation and reduced early neonatal deaths in Indonesia, Titaley, Dibley, Roberts, Hall and Agho (2010:502) state that the risk of early neonatal deaths was reduced by 34% in infants born to mothers who received two or more tetanus toxoid injections and by 47% in those born to mothers who received iron and folic acid supplements. The risk was reduced by 44% for mothers taking less than 30 iron and folic acid supplement tablets during pregnancy, by 50% for those taking 30-89 tablets, by 53% for those taking 90-119 tablets and by 44% for those taking 120 or more tablets

4.3.1.5 Risk grading

According to the standard of the DoH (2007:26), in the final assessment of pregnant women, the risk factors are checked and planned for further antenatal care and delivery, the best estimate of gestational age based on the evidence is obtained from the date of the last normal menstrual period, foetal palpation, measurements of SFH and ultrasound are done if available and a plan is devised for dealing with any problems that may arise.

The researcher found that 14% (n=11) of the booked mothers (n=78) were graded as high risk, 8% (n=6) as medium risk and 50% (n=39) as low risk. In 28% (n=22) of the mothers there was no record of risk grading.

The neonatal deaths among the mothers rated as high risk (n=11) was 45% (n=5), medium risk (n=6) 67% (n=4), low risk (n=39) 56% (n=22).

According to Chen et al (2007:122), the inadequacy of prenatal care is associated with increased neonatal death whether antenatal high risk conditions are present or not.

4.3.1.6 Information of antenatal follow ups

According to the DoH (2007:27), information must be provided to all pregnant women, both verbally and in the form of written or illustrated cards or pamphlets. A provisional delivery plan should be given to all pregnant women at the end of the first visit, reflecting the expected date of delivery based on the best estimate of gestational age, place of delivery (whether community health centres or hospital), mode of delivery (whether vaginal or caesarean section), who will deliver the baby (whether midwife or doctor), pain relief options including non-pharmacological methods, a transport plan for emergency or delivery, including important contact numbers and preparation for possible home delivery.

Figure 4.29 shows the antenatal follow-ups at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

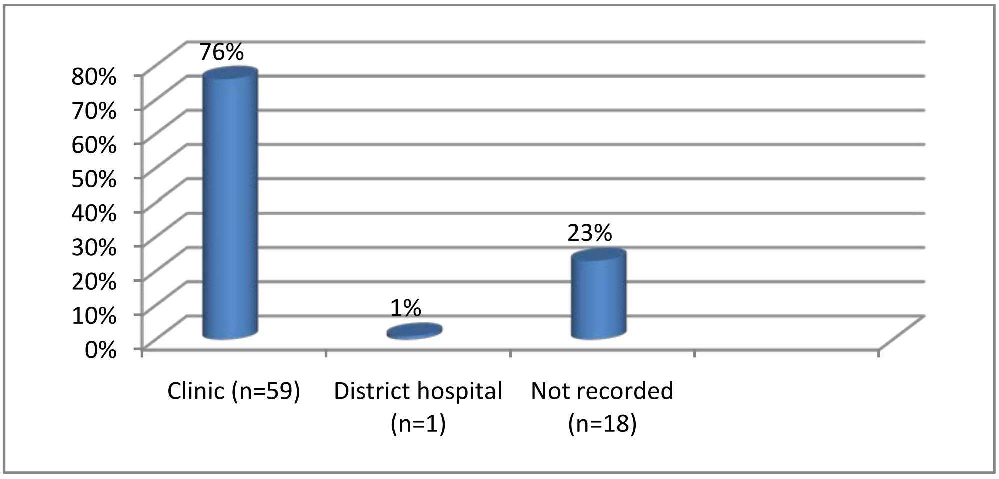

Figure 4.29

Antenatal follow-up (n=78)

Seventy-six percent (n=59) of the booked mothers (n=78) were to attend the antenatal follow–ups at the local clinic, while 1% (n=1) were to attend at the district hospital. In 23% (n=18) there was no record of where the mothers were to attend the antenatal follow ups.

The findings from a study by Khatib et al (2009:441) state that 58% of pregnant women received diet-related advice, family planning-related advice (40.6%) and breastfeeding-related advice (39.1%).

In this study, the researcher did not identify any of the above-mentioned advice on the records to draw any inferences on how it affects the pregnancy outcome.

4.3.1.7 Information about the delivery plan

All pregnant women should be in possession of a written plan for the birth of their babies and for dealing with unexpected adverse events, such as complications or emergencies that may occur during pregnancy, childbirth or the immediate postnatal period. They should discuss and review this plan with a skilled attendant at each antenatal assessment and at least one month prior to the expected date of birth. This serves to assist them and their partners and families to be adequately prepared for childbirth by making plans on how to respond if complications or unexpected adverse events occur affecting the mother and/or the baby at any time during pregnancy, childbirth or early postnatal period (WHO 2007b:1).

Table 4.15 depicts the information on delivery plan at the first booking of those mothers (n=78) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.15 Information on delivery plan (n=78)

Delivery place	Frequency	Percentage (n=78)
Clinic	11	14%
District hospital	43	55%
Not recorded	24	31%
Total	**78**	**100%**

The records showed that 14% (n=11) of the booked mothers (n=78) were told that they were supposed to deliver at the clinic and that 55% (n=43) were to deliver at the district hospital. In 31% (n=24) of the cases there was no record of the delivery plan.

The findings of the study is consistent with the results of the study done by Khatib et al (2009:442) who found that mothers who received the minimum recommended antenatal care were more likely to seek professional assistance during delivery.

4.3.2 Section B – Subsequent antenatal visits

In Section B the data on the subsequent visits of the booked mothers with regard to the number of the antenatal visits, the examinations performed and investigations done, and the information given during the visits, were analysed.

The standard set for subsequent antenatal visits aims at providing a ‘basic antenatal care’ schedule of four follow-ups for women without risk factors. Following an early booking visit (<12 weeks), return visits should be scheduled for 20, 26, 32 and 38 weeks and at 41 weeks if the woman is still pregnant. The return visit schedule of women with risk factors will depend on their specific problems (DoH 2007:28).

Of the 78 booked mothers, 86% (n=67) made the subsequent antenatal visits. No information was available about the follow-up visits of the remaining 14%.

4.3.2.1 Number of antenatal visits

The number of antenatal visits of the 78 booked mothers had a mean of 2.6 with a standard deviation of 0.9 and standard error of mean at 0.1. The upper mean was 2.8 and the lower mean 2.4. The upper quartile was at 3.0 and the lower quartile 2.0.

All pregnant women should have at least four antenatal assessments by or under supervision of a skilled attendant. These should, as a minimum, include all the interventions outlined in the new WHO (2007b:29) antenatal care model and be spaced at regular intervals throughout the pregnancy, commencing as early as possible in the first trimester to prevent, alleviate, treat or manage health problems/disease (including those directly related to pregnancy) that are known to have an unfavourable outcome on pregnancy, and to provide women and their families/partners with appropriate information and advice for a healthy pregnancy, childbirth and postnatal recovery, including care of the newborn, promotion of early exclusive breastfeeding and assistance with decisions about future pregnancies in order to improve pregnancy outcomes (WHO 2007b:29). The findings of Lincetto, Mothebesoane-Anoh, Gomez and Munjanja (2006:54) in *Opportunities for Africa’s Newborns* are consistent with this.

According to Chen et al (2007:124) inadequate prenatal care is associated with increased risk of neonatal death when pregnancies are complicated by anaemia, cardiac disease, lung disease, chronic hypertension, diabetes, renal disease, pregnancy-induced hypertension and previous preterm/small for gestational age births. Inadequate prenatal care is also associated with higher neonatal mortality even where high-risk antenatal conditions are not present

4.3.2.2 Gestational age at the first visit

The gestational age at the first visit had a mean of 22.6, with a standard deviation of 5.7 and standard error mean of 0.6. The upper mean was 23.9 and the lower mean 21.2. The upper quartile was at 26.0 and the lower quartile 18.0.

4.3.2.3 Gestational age at the second visit

Eighty-six percent of the mothers (n=67) attended the second antenatal visit. The gestational age at the second visit had a mean of 28.9, with a standard deviation of 4.0 and standard error mean of 0.4. The upper mean was 29.8 and the lower mean 27.9. The upper quartile was 32.0 and the lower quartile 26.0.

4.3.2.4 Gestational age at the third visit

At the third visit, there were 44 (56%) of the expecting mothers present. The gestational age at the third visit had a mean of 32.1, with a standard deviation of 3.2 and standard error mean of 0.4, while the upper mean was 33.1 and the lower mean 31.1. The upper quartile was 35.0 and the lower quartile 30.0.

4.3.2.5 Gestational age at the fourth visit

Only 16 mothers (21%) attended the fourth visit. At the fourth visit the mean was 35.7, with a standard deviation of 2.7 and standard error mean of 0.6, while the upper mean was 37.1 and the lower mean 34.3. The upper quartile was 37.0 and the lower quartile 32.0.

Khatib et al (2009:440) found that 7.5% of women who registered in the third trimester had undergone three antenatal check-ups as compared to 48.3% and 30.8% of women registered in the first and second trimester respectively. These findings are consistent with the results of this study. Eighty-six percent of women attended the second antenatal care visit, 56% attended the third antenatal care visit and only 21% attended the fourth antenatal care visit.

Khatib et al (2009:441) further indicated that women who had attended the minimum recommended antenatal services were three times more likely to deliver babies with normal birth weight than mothers who had not.

According to the country profiles, coverage of at least four antenatal visits is lower at 44% and there is a slower progress in sub-Saharan Africa than in other regions, with an increase in coverage of only four percent during the past decade (Lincetto et al 2006:56).

4.3.2.6 Foetal movements

The findings showed that foetal movements were checked in 86% (n=67) of the booked mothers (n=78). The foetal movements were found to be normal in 99% (n=66) of the mothers. In 1% (n=1) of the mothers there was no record kept of foetal movements.

Foetal movement counting is indicated for high-risk pregnancies, e.g. pre-eclampsia, diabetes mellitus, intrauterine growth impairment, previous unexplained stillbirth. The mother should be asked to count foetal movements for one hour at the same time every day, after breakfast. The number of movements should be recorded on a foetal movement chart. If there are four or more movements in one hour, the count is repeated at the same time on the next day. If there are fewer than four movements in one hour, or less than half of the hourly average (after about a week of counting), the mother should count foetal movements for one more hour. If there are still fewer than four movements or less than half of the hourly average, a cardiotocograph is indicated to assess foetal well-being. Delivery may be considered depending on the clinical situation (DoH 2007:31).

In the study done by Sinha et al (2007:42) it was found that intrauterine restriction was detected in 11% of cases and the babies were delivered early due to foetal distress. All had reduced liquor volume. It was established, further, that foetal movements are not routinely counted but that mothers need to observe any change in the pattern of the movements.

4.3.2.7 Blood pressure measurements

Of the 67 mothers who came for antenatal follow-up visits, 73% (n=49) had blood pressure ranging between 100/60 and 120/80 mmHg, a reading of between 121/81and 130/90 mmHg accounted for 21% (n=14) and in 6% (n=4), the blood pressure was140/90 mmHg or higher.

Table 4.16 shows the blood pressure measurements at the subsequent follow-ups of those mothers (n=67) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.16 Blood pressure measurements on subsequent follow-ups (n=67)

Blood pressure measurement	**Frequency**	**Percentage (n=67)**
100/60-120/80 mmHg	49	73%
121/81-130/90 mmHg	14	21%
≥140/90 mmHg	4	6%
Total	**67**	**100%**

The incidence of neonatal deaths in mothers whose blood pressure was between 100/60 and 120/80 mmHg (n=49) was 63% (n=31), between 121/81 and 130/90 mmHg (n=14), 50% (n=7), and above 140/09 (n=4) 25% (n=1).

The study done by Chen et al (2009:1045) showed that mothers with recurrent pre-eclampsia had heavier babies, which reduces the risk of neonatal deaths. This was borne out by this study.

4.3.2.8 Pallor

In only two of the 67mothers who attended the subsequent antenatal visits (3%), was pallor recorded as normal. In 97% (n=65) there was no record of whether pallor was found.

The incidence of neonatal deaths in the mothers with no record of pallor assessment (n=65) was high 58% (n=38), when compared to the absence of neonatal deaths in the mothers whose skin colour was normal (n=3).

According to Chen et al (2007:124) inadequate prenatal care is associated with increased risk of neonatal death when pregnancies are complicated by anaemia, cardiac disease, lung disease, chronic hypertension, diabetes, renal disease, pregnancy-induced hypertension and previous preterm/small for gestational age births. Inadequate prenatal care is also associated with higher neonatal mortality even where high-risk antenatal conditions are not present

4.3.2.9 Symphysis fundal height measurements

Of the 67 mothers who attended the subsequent antenatal visits, 84% (n=56) had an SFH measurement between the 10^{th} and 90^{th} percentile; in 6% (n=4), the SFH measurement was above the 90^{th} percentile and in 6% (n=4) the SFH measurement was below the 10^{th} percentile. SFH measurements were not recorded in 4% (n=3) cases.

Table 4.17 shows the SFH measurements at subsequent visits of those mothers (n=67) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.17 SFH measurements on subsequent visits (n=67)

SFH measurements	Frequency	Percentage (n=67)
10^{th} – 90^{th} percentile	56	84%
>90^{th} percentile	4	6%
<10^{th} percentile	4	6%
Not recorded	3	4%
Total	**67**	**100%**

The neonatal death rate for the mothers with an SFH of between the 10^{th} and the 90^{th} percentile (n=56) was 63% (n=35), for those <10^{th} percentile (n=4) 50% (n=2) and for those whose SFH was not recorded (n=4) 50% (n=2). None of the babies of mothers with an SFH of above the 90^{th} percentile died.

The findings of the study contrast with the results of that done by Simonet and Luo (2010:552) who found that infants who were small for their gestational age presented a higher risk of neonatal death and a low five-minute Apgar score over the entire gestational age range.

4.3.2.10 Measurement by palpation

In the mothers who attended subsequent antenatal visits (n=67), 12% (n=8) had abdominal palpation below 28 weeks gestation, while abdominal palpation between 28-36 weeks gestation was done in 84% of cases (n=56). Abdominal palpation was done to 4% (n=3) of the mothers above 37 weeks gestation.

The results indicate that there is a significant link between gestational age and neonatal deaths. Seventy-five percent (n=6) of mothers whose measurement by palpation showed that the gestational age of their babies was less than 28 weeks (n=8), experienced neonatal deaths; those between 28 and 36 weeks (n=56) accounted for 57% of the deaths (n=32) and those above 37 weeks (n=3) for 33% (n=1).

The study by Jehan et al (2009:134) is consistent with the findings of this study in that they established that a gestational age below 37 weeks is associated with neonatal death (58.5%).

4.3.2.11 Sonar

The data were collected from the 67 mothers who attended the subsequent antenatal visits. Sonars were performed on only 13% (n=9) of the mothers; no sonars were performed on the remaining 87% (n = 58).

4.3.2.12 Pelvic assessment

A pelvic assessment was done on only 2% (n=1) of the 67 mothers who attended the subsequent antenatal visits. No pelvic assessment was done on 95% (n=64) and in 3% (n=2) there was no record of pelvic assessment.

4.3.2.13 Urine analysis

The urine is tested for protein, glucose, blood and ketones at every visit to check for any urinary infections during pregnancy. The HIV test is repeated at 32 weeks of pregnancy for all women who tested negative at the initial testing. The blood test for haemoglobin is repeated at 32 weeks and 38 weeks, and rapid plasma regain is also repeated at ±36 weeks if the first test was negative before 20 weeks (DoH 2007:28).

Table 4.18 shows the results of urinalysis at the subsequent visits of those mothers (n=67) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.18 Urinalysis at subsequent visits (n=67)

Urinalysis	**Frequency**	**Percentage**
Protein and leucocytes	3	4%
Protein and blood	1	2%
Protein and glucose	1	2%
Protein only	2	3%
Blood and leucocytes	2	3%
Blood only	4	6%
Leucocytes only	5	7%
Normal	49	73%
Total	**67**	**100%**

Of the 67 mothers who attended the subsequent antenatal visits, 4% (n=3) presented with protein and leucocytes during their antenatal care, 2% (n=1) presented with protein and blood, 2% (n=1) with protein and glucose and 3% (n=2) with protein only. Three percent (n=2) of the mothers presented with blood and leucocytes and 6% (n=4) with blood only. Seven percent of the mothers (n=5) presented with leucocytes only. Treatment for urinary tract infection was given during pregnancy to all the mothers with abnormalities in the urine. Seventy-three percent (n=49) of the mothers had normal urine.

The results of the study tally with those in the study by Khatib et al (2009:443) who established that urinalysis was done in about 80% of the pregnant women during antenatal care.

4.3.2.14 HIV test done if test refused at initial visit

Table 4.19 shows the results of HIV testing at the subsequent visits of those mothers (n=67) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.19 HIV testing on subsequent visits (n=67)

HIV testing	**Frequency**	**Percentage (n=67)**
Tested	10	15%
Not tested	57	85%
Total	**67**	**100%**

Of the 67 mothers who attended the subsequent antenatal visits, 15% (n=10) were tested for HIV. Eighty-five percent (n=57) were not tested. Of the ten mothers who were tested for HIV, 10% (n=1) tested positive and in 90% (n=9) of the cases there was no record of the results.

In the study done by Bodkin et al (2006:739) it is recommended that midwives assess the risk posed to HIV positive pregnant women as there is a high prevalence of HIV-related conditions that may need the commencement of prophylaxis or treatment of opportunistic infections.

4.3.2.15 Haemoglobin at 32 weeks

It has been found that anaemia in pregnancy is associated with increased risks of stillbirth, low birth weight, preterm and neonatal deaths (Lincetto et al 2006:58).

Table 4.20 shows the results of haemoglobin testing at subsequent visits of those mothers (n=67) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.20 HB testing at subsequent visits (n=67)

HB repeat	Frequency	Percentage (n=67)
Not checked	65	97%
Checked	2	3%
Total	**67**	**100%**

The majority of the 67 mothers who attended the subsequent antenatal visits (97% (n=65), were not subjected to further haemoglobin testing at 32 weeks. In only 1% (n=1) was a haemoglobin level of between 12 and 18 g/dl found, and in 1% (n=1) the haemoglobin level was below 10 g/dl.

There was no record of any haemoglobin checking at 38 weeks in any of the mothers' records 100% (n=67). Some 54% (n=36) experienced neonatal deaths, as compared to a neonatal death rate of 55% (n=36) in mothers who had not been checked at 32 weeks (n=65).

The findings of the study contrast with the results in the study by Khatib et al (2009:443) who found that haemoglobin testing was done in about 80% of the pregnant women during antenatal care.

4.3.2.16 Repeat information for danger signs of risks during pregnancy

The information for danger signs of the risks during pregnancy is repeated, delivery and transport plans are reviewed, as well as feeding and contraceptive choices presented at 32 and 38 weeks. At 38 weeks, the woman is reminded to bring her antenatal card when she presents herself to the clinic or hospital in labour (DoH 2007:28).

Of the 67 mothers who attended the subsequent antenatal visits, the information for danger signs in pregnancy was repeated in 43% (n=29) of the cases. In 57% (n=38) of the cases, there was no record of the repeat information given.

There were no significant variations between the neonatal deaths experienced by the mothers who were given repeat information on danger signs (n=29), 59% (n=17) and those who were not given repeat information (n=38), 58% (n=22).

The last visit should be scheduled around 37 weeks of gestation or near the expected date of birth to ensure that appropriate advice and care is provided to prevent and manage problems, as stated by Lincetto et al (2006:54).

4.3.2.17 Review of the delivery plan

The delivery plan was reviewed in 37% (n=25) of the 67 mothers who attended the subsequent antenatal visits. There was no record of the delivery plan in the remaining 63% (n=42).

Sixty percent (n=15) of the mothers whose delivery plan was reviewed (n=25) experienced neonatal deaths, compared to 57% (n=24) of the mothers who had no record of a delivery plan (n=42). There is therefore no significant difference between the two groups.

The existing literature Chen et al (2007:124) differs from the findings of this study in that the mothers whose delivery plan was reviewed had higher neonatal deaths than those whose plan was not reviewed.

Lawn, Mongi and Cousens (2006:17) established that when women are unhealthy or have complications during pregnancy or childbirth, they suffer and their babies do, too.

4.3.3 Section C – Admission in labour

In this section, the researcher analysed the information obtained during the admission of the mother in labour relating to antenatal risk factors and the assessment of the mother. It is imperative that the history be taken on admission as it assists in the identification of high risk factors before and during labour which can have detrimental effects on the mother and the foetus. The antenatal card should be carefully reviewed and risk factors noted. Unbooked mothers should be interviewed as if they were attending antenatal care for the first time. The mother's HIV status is assessed by decoding using the national coding system. If the HIV status is not noted or cannot be decoded, ask confidentially whether the HIV test was done and what the result was. The nature of labour pains, vaginal bleeding, foetal movements, passing of liquor and any other relevant symptoms should be noted (DoH 2007:34).

On admission, a full general, abdominal and vaginal examination must be performed. This assessment provides the baseline data against which future observations and assessments can be made as labour progresses.

Of the 100 babies admitted to the neonatal unit, 88 mothers were admitted while in labour, while 12 of the mothers delivered before admission.

4.3.3.1 Antenatal risk factors

Of the 88 mothers whose babies were admitted to the nursery, 89% (n=78) were assessed for antenatal risk factors, 4% (n=4) were not assessed and in 7% (n=6) there was no record of assessment.

Figure 4.30 shows the risk assessment on admission of the mothers (n=88) whose babies were admitted to the neonatal unit during the months of January to December 2009.

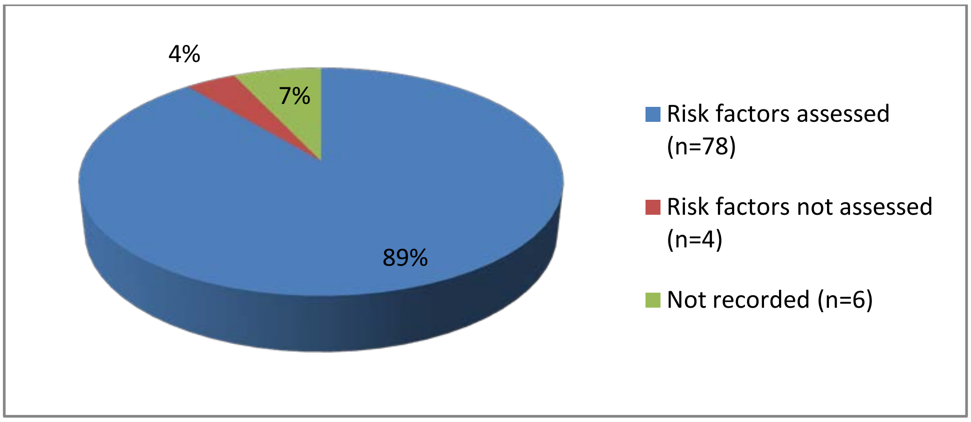

Figure 4.30
Risk assessment on admission (n=88)

Complications during the antenatal period cause a median increased risk of 4.5 for stillbirth or neonatal death as cited by Lawn, Mongi and Cousens (2006:17).

4.3.3.2 Antenatal history taken if woman is unbooked

Thirteen mothers were unbooked on admission. Of these, the antenatal history was taken in only 15% (n=2) and in 85% (n=11) there was no record of the antenatal history.

4.3.3.3 HIV status decoded on admission

Figure 4.31 depicts the HIV results on admission of the mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

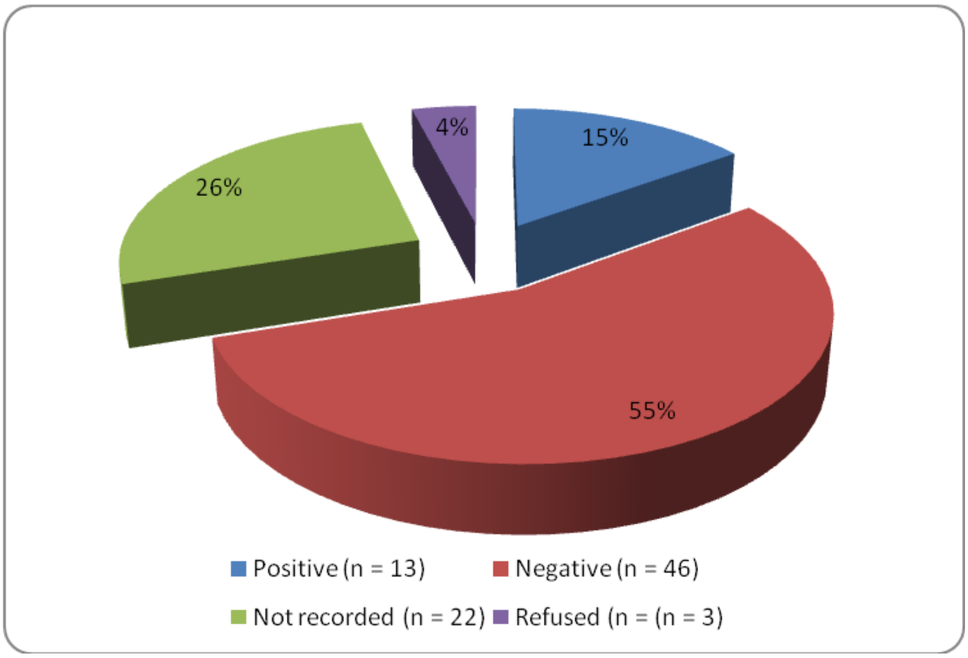

Figure 4.31

HIV results on admission (n=84)

There were 84 mothers who had HIV coding on admission; four of the mothers were not coded. Figure 4.31 shows the HIV results on admission of the mothers. The mothers who tested negative on admission accounted for 55% (n=46), followed by 26% (n=22) whose results were not recorded. Fifteen percent (n=13) of the mothers were HIV positive and 4% (n=3) of the mothers refused to be tested during antenatal care.

The 22 mothers whose HIV status was unknown on admission and the three that refused to be tested during antenatal care (n=25) were counseled for HIV on admission. Only 12% (n=3) of the mothers tested HIV and the HIV test was not done on 4% (n=1) of these. In 84% (n=21) there was no record of whether the HIV test was done or not.

Bodkin et al (2006:739) found that the HIV positive pregnant mothers weighed less and delivered earlier than HIV negative pregnant mothers. As a result, midwives are required to be able to assess for potential risk factors such as low birth weight, intra-uterine growth restriction and preterm labour which put babies at an increased risk of neonatal morbidity and mortality.

4.3.3.4 Condition of liquor if membranes are ruptured

Of the 88 mothers who were admitted in labour, the majority (69%, n=61) were admitted with membranes intact while the membranes had ruptured in 31% (n=27) of cases.

Table 4.21 shows the condition of liquor where the membranes had ruptured for those mothers (n=27) whose babies were admitted to the neonatal unit during the months of January to December 2009.

Table 4.21 Condition of liquor (n=27)

Condition of liquor	Frequency	Percentage (n=27)
Clear liquor	10	37%
Meconium stained liquor	3	11%
Offensive liquor	1	4%
Not recorded	13	48%
Total	**27**	**100%**

Of the 27 mothers who were admitted with ruptured membranes, 37% (n=10) were draining clear liquor, 11% (n=3) of the mothers had meconium-stained liquor (MSL) and only 4% (n=1) had offensive liquor. In 48% (n=13) of the mothers there was no record of the condition of the membranes.

Figure 4.32 shows the neonatal death rate in relation to the condition of liquor on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

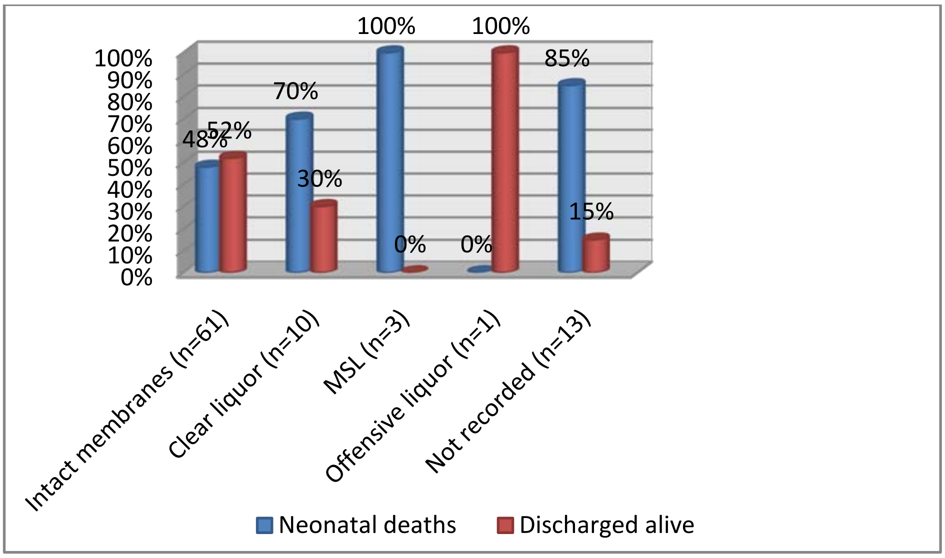

Figure 4.32

Neonatal death in relation to condition of membranes (n=88)

The 61 mothers who were admitted with membranes intact accounted for 48% (n=29) of neonatal deaths, while 52% (n=32) of the babies were discharged alive.

Of the 10 mothers who were admitted with ruptured membranes draining clear liquor, 70% (n=7) experienced neonatal deaths and 30% (n=3) of the babies were discharged alive.

All three of the mothers who had meconium-stained liquor (100%) experienced neonatal death.

The one mother whose liquor was offensive was discharged with her baby alive. Of the 13 mothers where the condition of liquor was not recorded, 85% (n=11) experienced neonatal deaths and 15% (n=2) of the babies were discharged alive.

In the study conducted in Manipal by Bhat and Rao (2008:202), researchers found that when the amniotic fluid is meconium-stained, neonates had a higher risk of meconium aspiration syndrome (11.3%) than otherwise (5%). These findings are consistent with the results of this study since all the neonates died where the liquor was meconium-stained.

Figure 4.33 depicts the duration of the rupture of the membranes on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

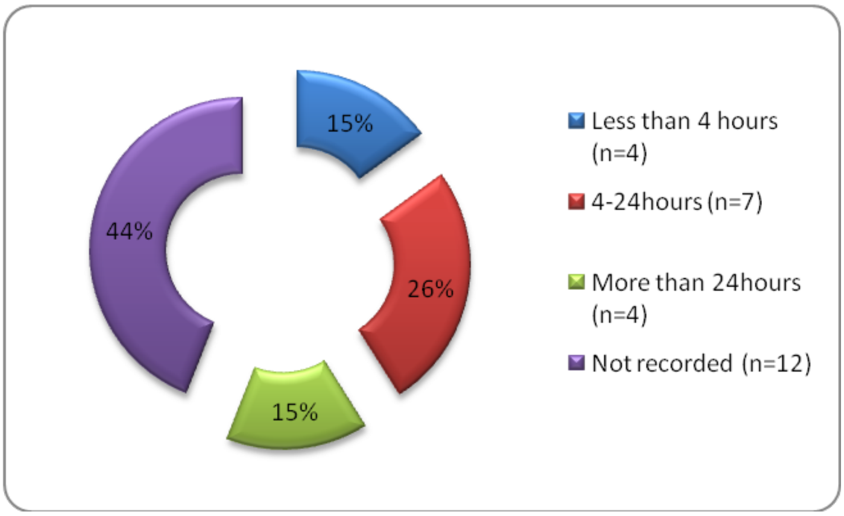

Figure 4.33

Duration of rupture of membranes on admission (n=88)

From figure 4.33 it appears that most of the 27 mothers who had ruptured membranes 44% (n=12) had no record of the duration of the rupture of their membranes. In 15% (n=4) the duration of the rupture was less than four hours and in another 15% (n=4) more than 24 hours, while 26% (n=7) of the mothers had ruptured membranes between five and 24 hours prior to delivery.

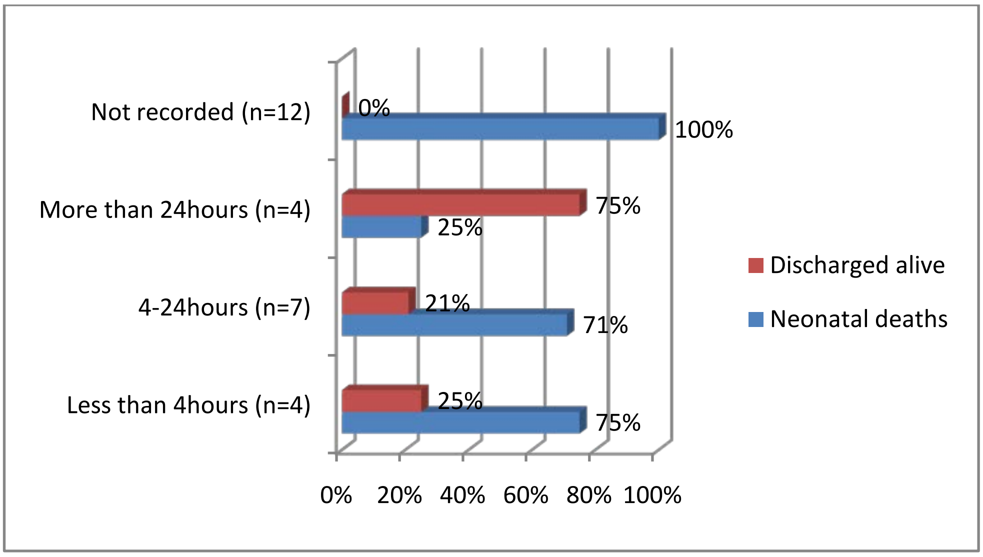

Figure 4.34

Neonatal deaths in relation to duration of rupture of membranes (n=27)

Of the four mothers whose membranes ruptured less than four hours before delivery, 75% (n=3) of the mothers experienced neonatal deaths, 25% (n=1) being discharged with the baby alive.

Of the seven mothers whose membranes ruptured between four and 24 hours before delivery, 71% (n=5) experienced neonatal deaths and 29% (n=2) of the babies were discharged alive.

Of the four mothers whose membranes ruptured more than 24 hours before delivery (n=4), 25% (n=1) experienced neonatal deaths and 75% (n=3) of the babies were discharged alive.

The twelve mothers who had no record of the duration of the rupture of their membranes all experienced neonatal deaths 100% (n=12).

The rate of adverse effects on neonates whose mothers developed chorioamnionitis due to preterm pre-labour rupture of membranes was higher at 34% as compared to those whose mothers did not develop chorioamnionitis (13%) (Oboro, Adekanle, Apantakuand Onadipe (2006:741). The findings of this study are consistent with those in the above-mentioned study.

4.3.3.5 Vital signs

4.3.3.5.1 Temperature

Table 4.22 shows the temperature ranges of the mothers (n=88) on admission.

Table 4.22 Temperature ranges of mothers on admission (n=88)

Temperature	Frequency	Percentage (n=88)
36ºC-37ºC	75	86%
<36ºC	2	2%
>37ºC	3	3%
Not recorded	8	9%
Total	**88**	**100%**

Of the 88 mothers who were admitted, the temperature was normal in 86% (n=75) cases, ranging between 36°C and 37°C, while there was hypothermia in 2% (n=2) of the mothers and hyperthermia in 3% (n=3). In 9% (n=8) of the mothers there was no record of temperature taken.

The findings of the study indicated that mothers with a temperature of less than 36ºC (n=2) experienced 100% (n=2) neonatal death, as did 67% (n=2) of those with a temperature above 37ºC (n=3), 59% (n=44) of those with a temperature between 36ºC-37ºC (n=75) and 75% (n=6) of the mothers whose temperature was not recorded (n=8).

The findings of the study done by Maayan-Metzger, Mazkereth, Shani and Kuint (2006:171) indicated that babies born to mothers with fever during labour were more likely to have meconium-stained amniotic fluid and to be dyspnoeic in the first hours after birth.

4.3.3.5.2 Blood pressure

Table 4.23 shows the blood pressure ranges of the mothers (N=88) on admission.

Table 4.23 Blood pressure ranges of mothers on admission (n=88)

Blood pressure	Frequency	Percentage (n=88)
100/60-120/80 mmHg	50	57%
121/81-130/90 mmHg	21	24%
>140/90 mmHg	10	11%
Not recorded	7	8%
Total	**88**	**100%**

The blood pressure of the 88 mothers who were admitted ranged between 100/60 and 120/80 mmHg in 57% (n=50) of the mothers, while it was between 121/81 and 130/90 mmHg in 24% (n=21) of the mothers and above 140/90 mmHg in 11% (n=10) of the mothers on admission. In 8% (n=7) there was no record of whether the blood pressure had been taken or not.

The neonatal death rate experienced by the mothers whose blood pressure fell in the range between 100/60 and 120/80 mmHg (n=50) was 62% (n=31); between 121/81 and 130/90 mmHg (n=21) it was 67%, those whose blood pressure was above 140/90 mmHg (n=10) experienced a 40% neonatal death rate (n=4) and in mothers whose blood pressure was not recorded (n=7) it was 86% (n=6).

These findings are supported by those of Chen et al (2009:1045) (see section (4.3.2.7)).

4.3.3.6 Oedema

Figure 4.35 depicts the incidence of oedema on admission in the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

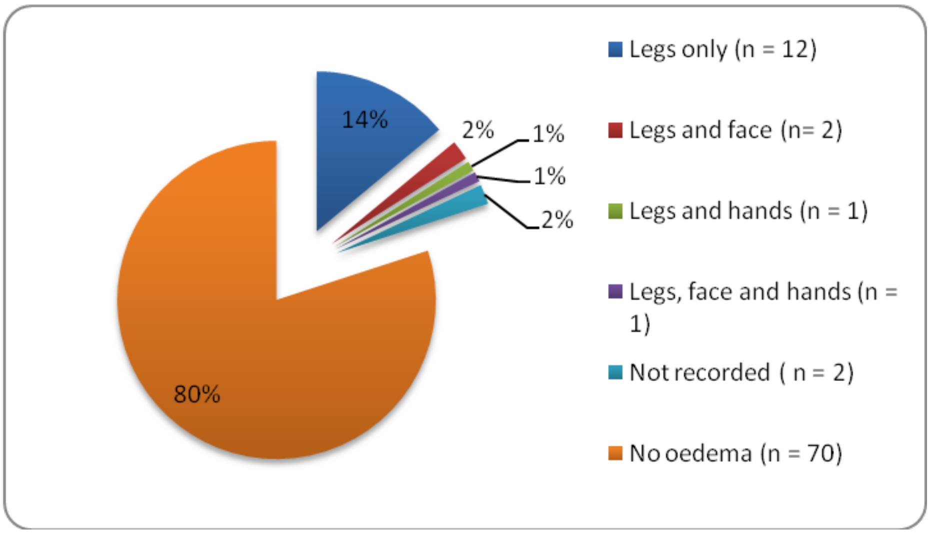

Figure 4.35

Oedema on admission (n=88)

Figure 4.35 shows the mothers who were admitted. Of the 88 mothers admitted, 80% (n=70) did not have oedema, while 14% (n=12) were admitted with oedema of the legs only, and 2% (n=2), had oedema of the legs and face only. The same number of mothers was admitted with oedema of the legs and hands and with oedema of the legs, face and hands; these accounted for a very small percentage namely 1% (n=1) respectively. In 2% (n=2) of the cases there was no record of whether they were admitted with oedema or not.

The oedema was found in all the mothers with elevated blood pressure. Twenty-five percent (n=4) of the mothers with oedema (n=16) had a blood pressure of between 121/81 and in 25% (n=4) the blood pressure was above 140/90. Fifty-eight percent (n=7) of the mothers with oedema of the face only (n=12) had neonatal deaths and 100% (n=2) of the mothers with oedema of both legs and face (n=2). The results indicate that there is a link between elevated blood pressure and oedema which put mothers more at risk of neonatal deaths.

4.3.3.7 Pallor

Table 4.24 shows the assessment of pallor in mothers (n=88) on admission.

Table 4.24 Pallor on mothers on admission (n=88)

Pallor	Frequency	Percentage (n=88)
No pallor	60	68%
Pallor present	1	1%
Not recorded	27	31%
Total	**88**	**100%**

Of the 88 mothers admitted, only 1% (n=1) presented with pallor, while 68% (n=60) did not. In 31% (n=27) of the cases there was no record of whether they had pallor or not when admitted.

The findings of this study are supported by the work of Chen et al (2007:122), discussed under section (4.3.2.1).

4.3.3.8 Symphysis fundal height

Figure 4.36 shows the symphysis fundal height on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

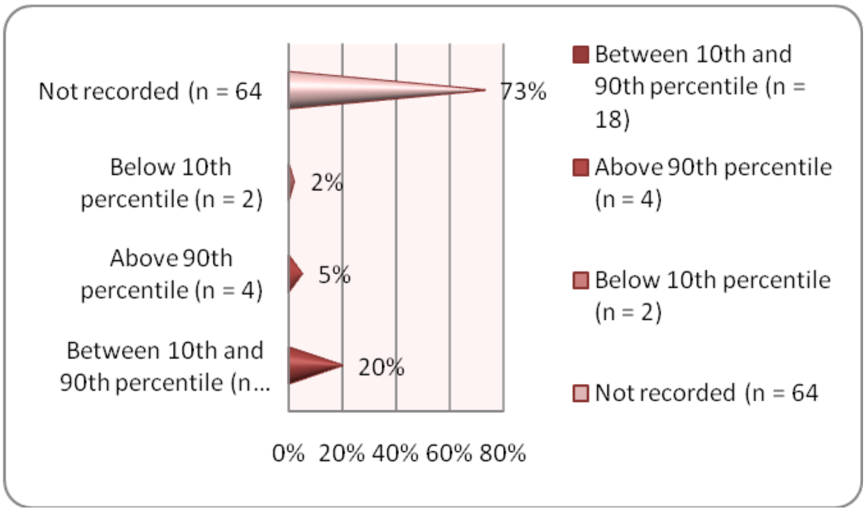

Figure 4.36

Symphysis fundal height on admission (n=88)

It was alarming to find that, of the 88 mothers who were admitted in labour, a large number were not assessed for symphysis fundal height on admission, namely 73% (n=64). It is shown in figure 4.36 that 20% (n=18) of the mothers had a symphysis fundal height of between the 10th and the 90th percentile while the symphysis fundal height below the 10th percentile accounted for only 2% (n=2) and that above the 90th percentile for 5% (n=4).

The study findings reflect that there was an 56% (n=10) incidence of neonatal deaths in mothers with a SFH between the 10th and the 90th percentile (n=18), 75% (n=3) in mothers with an SFH above the 90th percentile (n=3), 50% (n=1) in mothers with an SFH below 10th percentile (n=2) and 66% (n=42) in mothers whose SFH was not recorded (n=64).

In the study done by Vashevnik, Walker and Permezel (2007:303) it was found that the risk of perinatal death in large for gestational age infants and average for gestational age infants rose rapidly after 39 weeks gestation, something which cannot be argued in the results of this study as the SFH was not compared with the weeks of gestation.

4.3.3.9 Palpation

Table 4.25 depicts the gestational age by palpation on admission of the 88 mothers. Only 2% (n=2) of the mothers were admitted with a gestational age of below 28 weeks; 28% (n=25) had a gestational age of between 28 and 36 weeks and 64% (n=56) had a gestational age of above 37 weeks. In only 6% (n=5) of the cases was there no record of the gestational age by palpation.

Table 4.25 Gestational age by palpation (n=88)

Weeks by palpation	Frequency	Percentage (n = 88)
<8 weeks	2	2%
28-36 weeks	25	28%
>37 weeks	56	64%
Not recorded	5	6%
Total	**88**	**100%**

The two mothers who had a gestational age of below 28 weeks by palpation both experienced neonatal deaths

Of the 25 mothers who had a gestational age of between 28-36 weeks, 68% (n=17) experienced neonatal death and 32% (n=8) of the babies were discharged alive.

Of the 56 mothers who were admitted with a gestational age of above 37 weeks, 55% (n=31) experienced neonatal deaths and 45% (n=25) of the babies were discharged alive.

Of the five mothers whose gestational age was not recorded on admission, 20% (n=1) experienced neonatal deaths and 80% (n=4) of the babies were discharged alive.

Figure 4.37 shows the neonatal deaths in relation to the fundal height by palpation on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

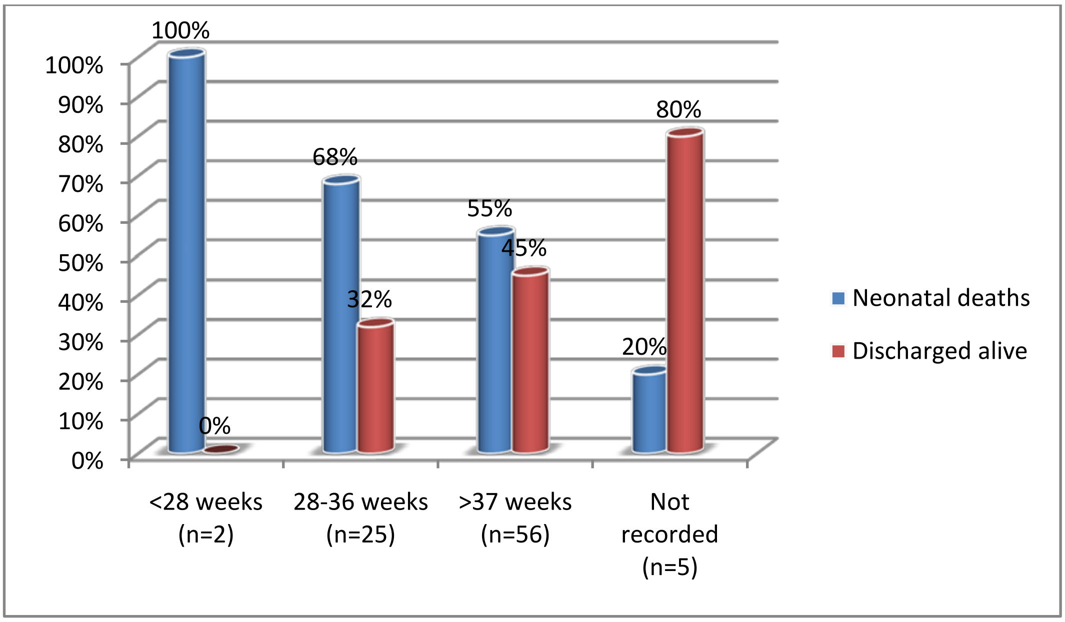

Figure 4.37

Neonatal deaths in relation to the fundal height by palpation on admission (n=88)

The findings of the study are consistent with the results in the study done by Lawn, Mongi and Cousens (2006:16), who found that babies born before 37 weeks of gestation have a risk of death that is 13 times greater than that for full term babies.

4.3.3.10 Lie of the foetus

Table 4.26 shows the lie of the foetus in mothers (n=88) on admission.

Table 4.26 The lie of the foetus in mothers on admission (n=88)

Lie	Frequency	Percentage (n=88)
Longitudinal	77	88%
Transverse lie	2	2%
Not recorded	9	10%
Total	**88**	**100%**

Of the 88 mothers who were admitted in labour, 88% (n=77) presented with a longitudinal lie of the foetus, 2% (n=2) had a foetus in a transverse lie, and in 10% (n= 9) of cases there was no record of the lie of the foetus.

Figure 4.38 shows the neonatal deaths in relation to the lie of the foetus on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

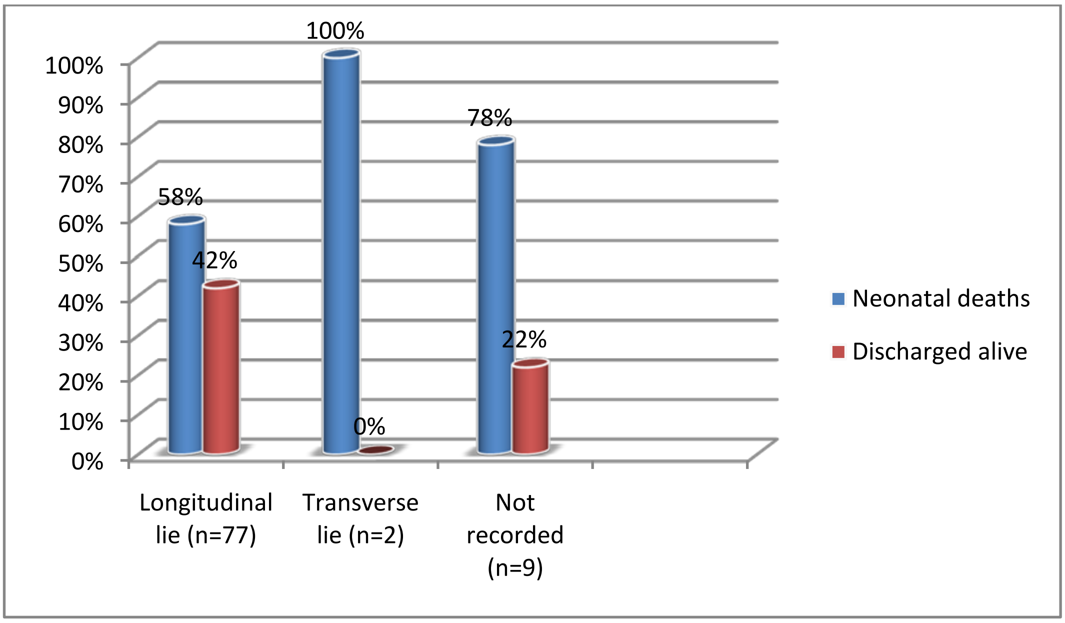

Figure 4.38

Neonatal deaths in relation to the lie of the foetus on admission (n=88)

Of the 77 mothers who presented with a longitudinal lie, 58% (n=45) experienced neonatal deaths and 42% (n=32) of the babies were discharged alive.

Both mothers who had a transverse lie experienced neonatal deaths (100%) (n=2).

Of the nine mothers where there was no record of the foetal lie, 78% (n=7) experienced neonatal deaths and 22% (n=2) of the babies were discharged alive.

4.3.3.11 Presentation of the foetus

Table 4.27 indicates the presentation of the foetus on admission of the 88 mothers. In this study, it was found that most cases (88%; n=77) there was a cephalic presentation of the foetus, while breech presentation accounted for only 1% (n=1). In 11% (n=10) of the mothers there was no record of foetal presentation.

Table 4.27 The presentation of the foetus in mothers on admission (n=88)

Presentation	Frequency	Percentage (n=88)
Cephalic	77	88%
Breech	1	1%
Not recorded	10	11%
Total	**88**	**100%**

Figure 4.39 shows the incidence of neonatal death in relation to the presentation of the foetus on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

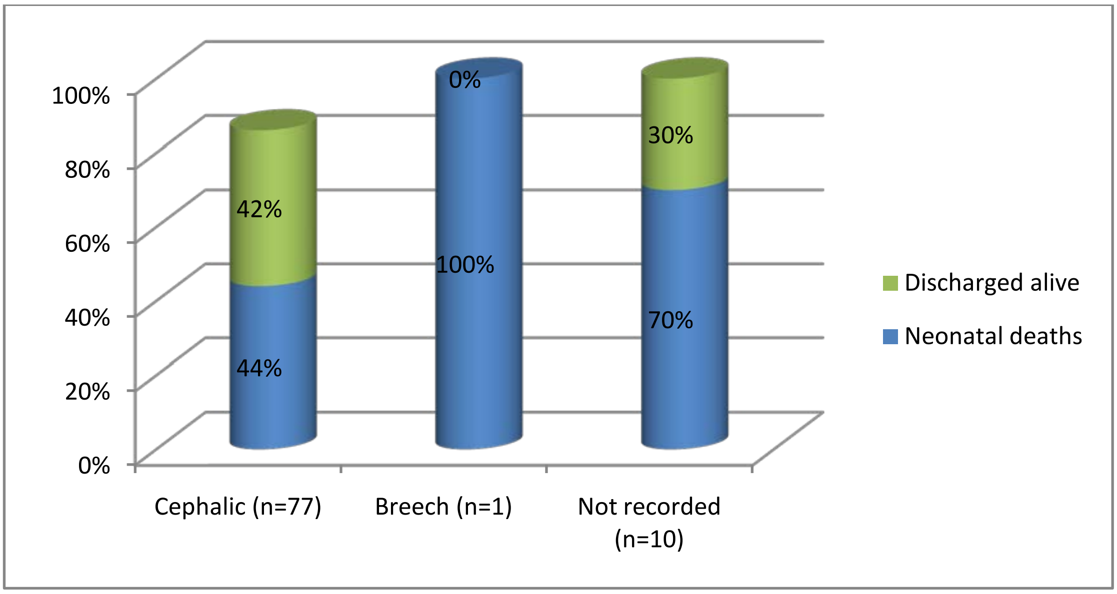

Figure 4.39

Neonatal deaths in relation to the presentation of the foetus on admission (n=88)

The study showed a high neonatal death rate in breech presentation (n=1) ((100% (n=1)) as compared to the cases where the presentation was not recorded (n=10) (70% (n=7)) and cephalic presentation (n=77) (58% (n=45)).

The results of the study are consistent with the findings of the study done by Chhabra et al (2006:569), who found that non-cephalic presentation (20.8%) was more often associated with perinatal death to cephalic presentation (6.6%).

4.3.3.12 Position of the foetus

Table 4.28 The position of the foetus on mothers on admission (n=88)

Position	Frequency	Percentage (n=88)
Anterior	64	73%
Not recorded	24	27%
Total	**88**	**100%**

In the 88 mothers who were admitted in labour, the researcher found that the anterior positions of the foetal head represented 73% (n=64), while 27% (n=24) of the foetal positions were not recorded.

Figure 4.40 shows the neonatal deaths in relation to the position of the foetus on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

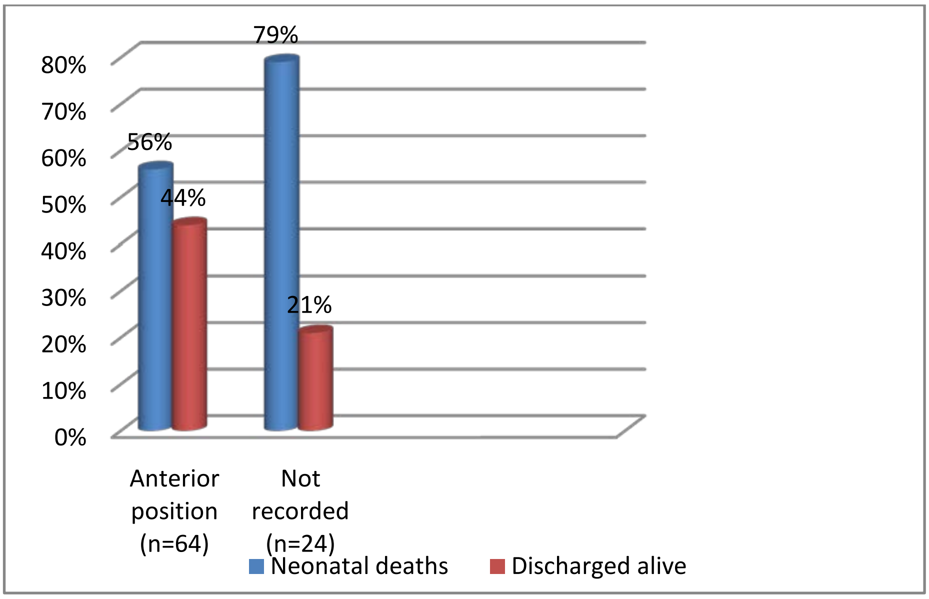

Figure 4.40

Neonatal deaths in relation to foetal position (n=88)

Of the 64 mothers who presented with an anterior position, 56% (n=36) experienced neonatal deaths and 44% (n=28) of the babies were discharged alive.

In 24 of the cases where the foetal positions were not recorded, 79% (n=19) of the babies died and 21% (n=5) were discharged alive. The fact that there were no records of posterior positions is cause for concern.

4.3.3.13 Attitude of the foetal head

Table 4.29 The attitude of the foetus on admission (n=88)

Position	Frequency	Percentage (n=88)
Flexed	53	60%
Not recorded	35	40%
Total	**88**	**100%**

Of the 88 mothers who were admitted in labour, the study found that in 60% (n=53) the attitude of the foetal head was well flexed and that in 40% (n=35) there was no record of the attitude of the foetal head.

4.3.3.14 Level of presenting part in fifths above the pelvic brim

Table 4.30 shows the level of the presenting part in fifths above the pelvic brim of mothers on admission.

Table 4.30 The level of the presenting part in fifths above the pelvic brim (n=88)

Level of presenting part in fifths above the pelvic brim	Frequency	Percentage (n=88)
5/5	8	9%
4/5	50	57%
3/5	6	7%
2/5	2	2%
Not recorded	22	25%
Total	**88**	**100%**

On admission of the 88 mothers, the researcher found that in 57% (n=50) the level of the presenting part was at 4/5, while in 9% (n=8) it was 5/5. In 7% (n=6) of the mothers, the level of the presenting part was at 3/5 and in 2% (n=2) the level of the presenting part was at 2/5. It is of concern to find that in 25% (n=22) of the cases there was no record of the level of the presenting part.

Figure 4.41 shows the neonatal deaths in relation to the level of the presenting part above the pelvic brim on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

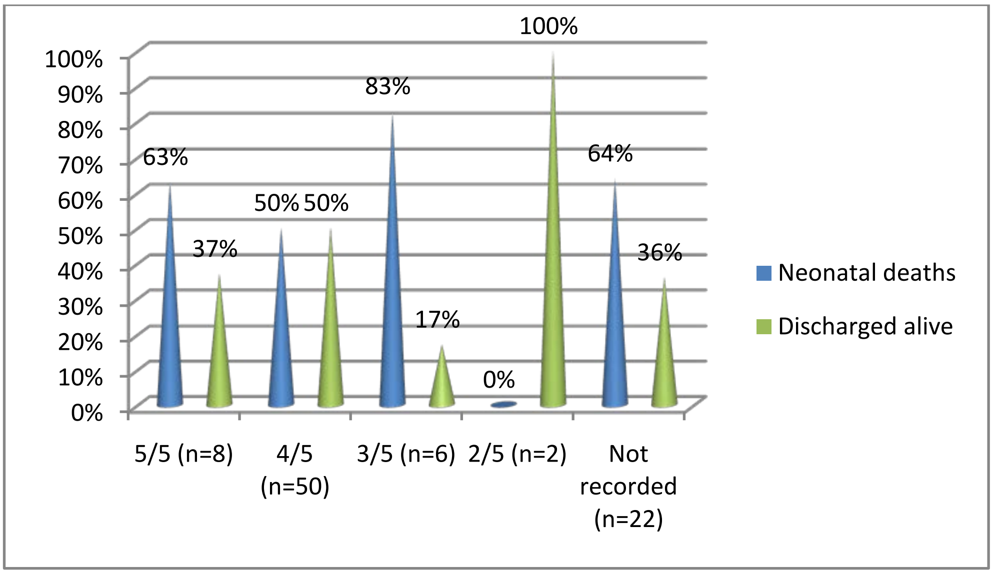

Figure 4.41

Neonatal deaths in relation to the level of presenting part in fifths above the pelvic brim (n=88)

Of the eight mothers who presented with the presenting part at 5/5 above the pelvic brim 63% (n=5) experienced neonatal deaths, while 37% (n=3) of the babies were discharged alive.

Of the 50 mothers who had the presenting part at 4/5 above the pelvic brim, 50% (n=25) experienced neonatal deaths and 50% (n=25) of the babies were discharged alive.

Of the six mothers whose presenting part was at 3/5 above the pelvic brim, 83% (n=5) experienced neonatal deaths and 17% (n=1) of the babies were discharged alive.

The two mothers whose presenting part was at 2/5 above the pelvic brim did not experienced neonatal deaths. Their babies were discharged alive.

Of the 22 mothers whose level of the presenting part was not recorded, 64% (n=16) experienced neonatal death, and 36% (n=9) of the babies were discharged alive.

4.3.3.15 Liquor volume

Table 4.31 shows the distribution of the liquor volume on admission.

Table 4.31 Liquor volume on admission (n=88)

Liquor volume	Frequency	Percentage (n = 88)
Adequate	45	51%
Polyhydramnios	3	4%
Oligohydramnios	1	1%
Not recorded	39	44%
Total	**88**	**100%**

Table 4.31 indicates that 51% (n=45) of the mothers had an adequate liquor volume on admission and that there was no record of the liquor volume in 44% (n=39), which is worrying. Polyhydramnios was identified in 4% (n=3) while oligohydramnios was identified in only 1% (n=1) of the mothers.

Figure 4.42 shows the neonatal deaths in relation to the liquor volume on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

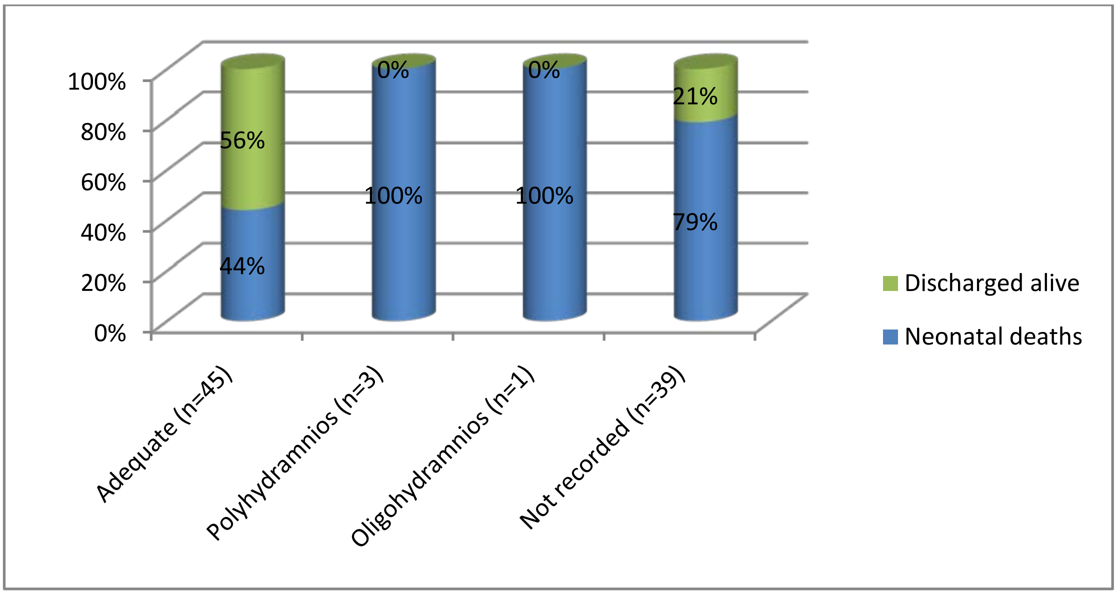

Figure 4.42

Neonatal deaths in relation to the liquor volume on admission (n=88)

The three babies whose mothers presented with polyhydramnios and the one who had oligohydramnios died before discharge. Of the 45 mothers who had an adequate liquor volume, 44% (n=20) experienced neonatal deaths while 56% (n=25) of the babies were discharged alive. Where there was no record of the liquor volume in (n=39) mothers, 79% (n=31) of the babies died while 21% (n=8) babies were discharged alive.

4.3.3.16 Uterine tone

Figure 4.43 shows the uterine tone of the 88 mothers on admission. The study found that in 81% (n=71) there was no record of the uterine tone, while 18% (n=16) had a soft uterus on admission and 1% (n=1) had a rigid uterus.

Figure 4.43 shows the uterine tone on admission of 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

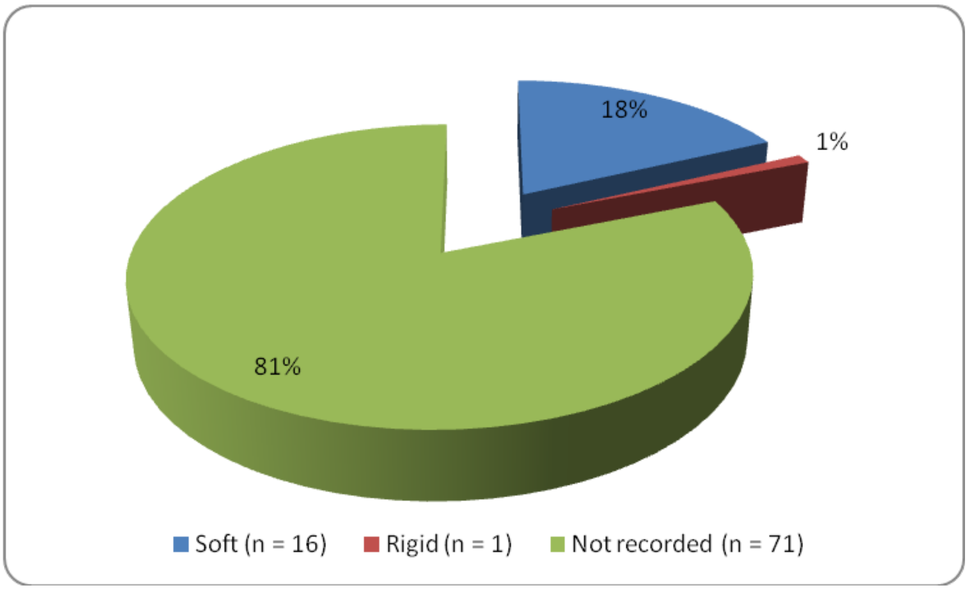

Figure 4.43

Uterine tone on admission (n=88)

Uterine tone appeared to have no significant effect on the incidence of neonatal deaths. The mother with a rigid uterus delivered a live baby and was discharged.

4.3.3.17 Strength of contractions

In the study, the researcher found that most of the 88 mothers were admitted with mild contractions; these accounted for 33% (n=29) of the sample. Nine percent (n=8) of the mothers were admitted with no contractions and those admitted with moderate and strong contractions accounted for 21% (n=8) and 29% (n=26) respectively. In 8% (n=7) of the cases there was no record of the state of their contractions on admission.

4.3.3.18 Foetal heart rate

Table 4.32 indicates the foetal heart rate of the 88 mothers on admission.

Table 4.32 Foetal heart rate on admission (n=88)

Foetal heart rate	Frequency	Percentage (n=88)
120-160 b/m	66	75%
<160 b/m	6	7%
<120 b/m	3	3%
Not recorded	13	15%
Total	**88**	**100%**

The researcher found that 75% (n=66) of the 88 mothers had a normal foetal heart rate, ranging from 120 to 160 beats per minute (b/m). Seven percent (n=6) had a foetal heart rate above 160 b/m and 3% (n=3) below 120 b/m. The foetal heart rate was not recorded in 15% (n=13) of the mothers admitted.

Figure 4.44 shows the neonatal deaths in relation to the foetal heart rate on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

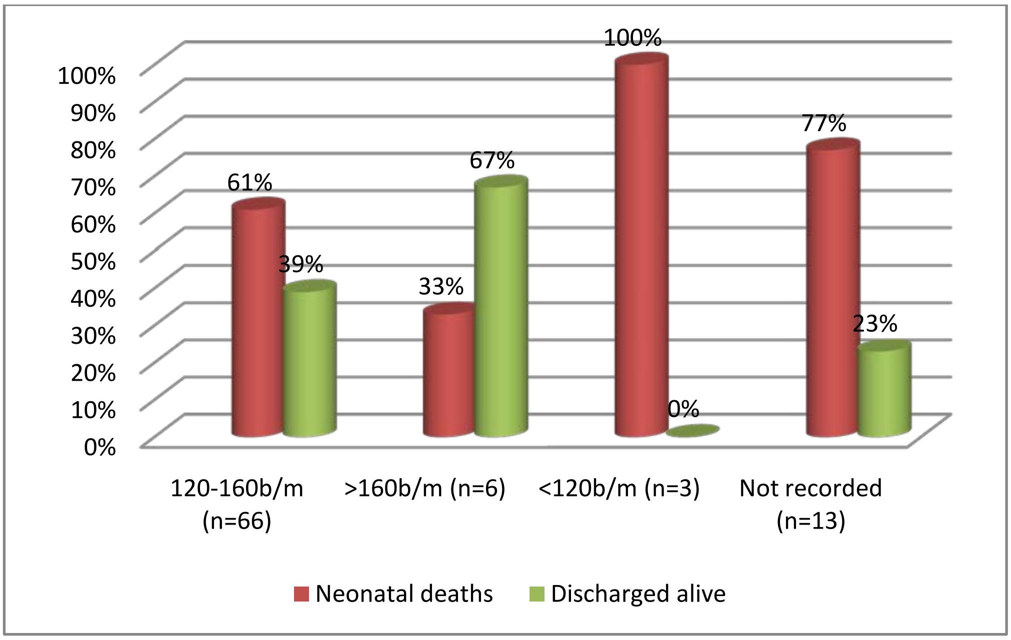

Figure 4.44

Neonatal deaths in relation to the foetal heart rate (n=88)

Of the 66 mothers who had a normal foetal heart rate, 61% (n=40) experienced neonatal deaths and 39% (n=26) of the babies were discharged alive.

Of the six mothers who had a foetal heart rate above 160 b/m, 33% (n=2) experienced neonatal deaths and 67% (n=4) of the babies were discharged alive. All three mothers who had a foetal heart rate below 120 b/m experienced neonatal deaths (100%).

Of the 13 mothers whose foetal heart rate was not recorded, 77% (n=10) experienced neonatal deaths and 23% (n=3) of the babies were discharged alive.

The results of the study are consistent with the findings in the study done by Velaphi and Pattinson (2007:103) who found that inadequate foetal monitoring during labour was one of the health worker-related factors of neonatal asphyxia-hypoxia deaths (13.0%).

4.3.3.19 Estimate of foetal weight

Table 4.33 indicates the estimate of foetal weight on admission of the 88 mothers.

Table 4.33 Estimate of foetal weight on admission (n=88)

Estimate of foetal weight	Frequency	Percentage (n=88)
<2499 kg	15	17%
2500 g-4000 g	38	43%
>4000 g	1	1%
Not recorded	34	39%
Total	**88**	**100%**

Of the 88 mothers admitted, the foetal weight was estimated to be less than 2499 g in 17% (n=15), while in 43% (n=38), it was estimated to be between 2500 g and 4000 g and in 1% (n=1) it was above 4000 g. In 39% (n=34) of the cases there was no record of any estimate of the foetal weight

Figure 4.45 shows the incidence of neonatal deaths in relation to the estimated foetal weight on admission of the 88 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

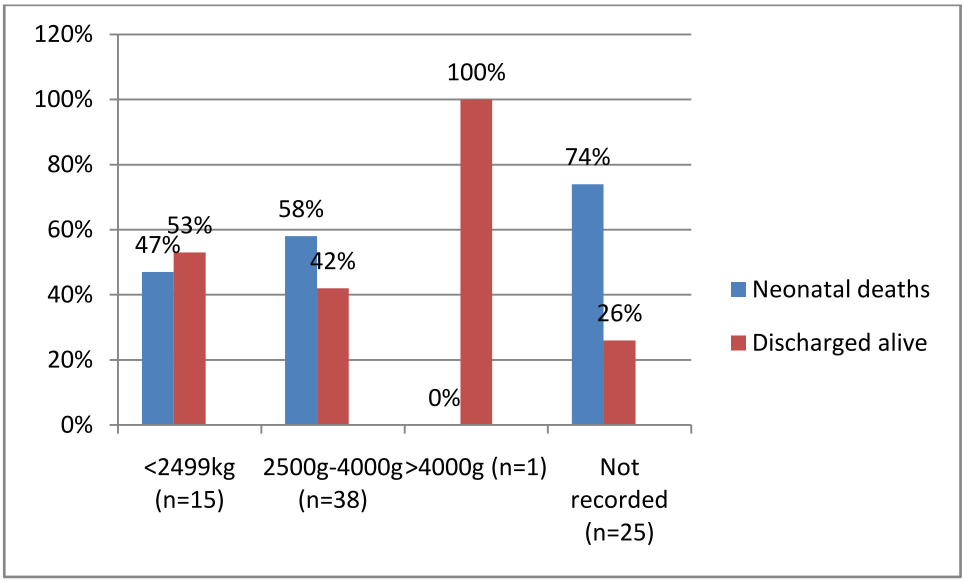

Figure 4.45

Neonatal deaths in relation to estimated foetal weight (n=88)

The findings of the study indicated that the neonatal deaths were highest when the estimated weight was not recorded (74% (n=25)); when the foetal weight was between 2500 g and 4000 g the death rate was 58% (n=22), as compared to 47% (n=7) when the estimated weight was below 2499 g.

4.3.3.20 Vaginal examination

A vaginal examination was performed on 89% (n=78) of the mothers on admission but not in the remaining 11% (n=10).

Condition of vulva and vagina

Table 4.34 Condition of vulva and vagina on admission (n=78)

Condition of vulva and vagina	Frequency	Percentage (n=78)
Healthy	71	91%
Warts/sores	1	1%
Not recorded	6	8%
Total	**78**	**100%**

The vulva and vagina were found to be in a healthy condition in 91% (n=71) of the 78 mothers on admission; there were sores/warts in only 1% (n=1) of the cases, and there was no record of the condition of the vulva in 8% (n=6).

Condition of the cervix

Table 4.35 Condition of the cervix on admission (n=78)

Condition of cervix	Frequency	Percentage (n=78)
Uneffaced	3	4%
Effacing	43	55%
Fully effaced	28	36%
Not recorded	4	5%
Total	**78**	**100%**

The study found that on admission only 4% (n=3) of the 78% (n=78) mothers had an uneffaced cervix, and that the cervix was effacing in 55% (n=43) of the cases. The cervix was fully effaced in 36% (n=28) and there was no record of the condition of the cervix in 5% (n=4).

Position of the cervix

Table 4.36 Position of the cervix on admission (n=78)

Position of the cervix	Frequency	Percentage (n=78)
Posterior	4	5%
Middle	4	5%
Anterior	28	36%
Not recorded	42	54%
Total	**78**	**100%**

The researcher found that the position of the cervix was not recorded in the majority of the 78 mothers on admission. This accounted for 54% (n=42). The cervix was found to be posterior in 5% (n=4) and in the middle in 5% (n=4) of the mothers respectively. In 36% (n=28) of the mothers the cervix was anterior.

Consistency of the cervix

Table 4.37 Consistency of the cervix on admission (n=78)

Consistency of the cervix	Frequency	Percentage (n=78)
Soft	42	54%
Firm	8	10%
Not recorded	28	36%
Total	**78**	**100%**

The study found that 54% (n=42) of the 78 mothers admitted had a soft cervix, and in 36% (n=28) there was no record of the consistency of the cervix. The cervix was found to be firm in 10% (n=8).

Dilatation of the cervix

Figure 4.46 shows the cervical dilatation of the 78 mothers on admission.

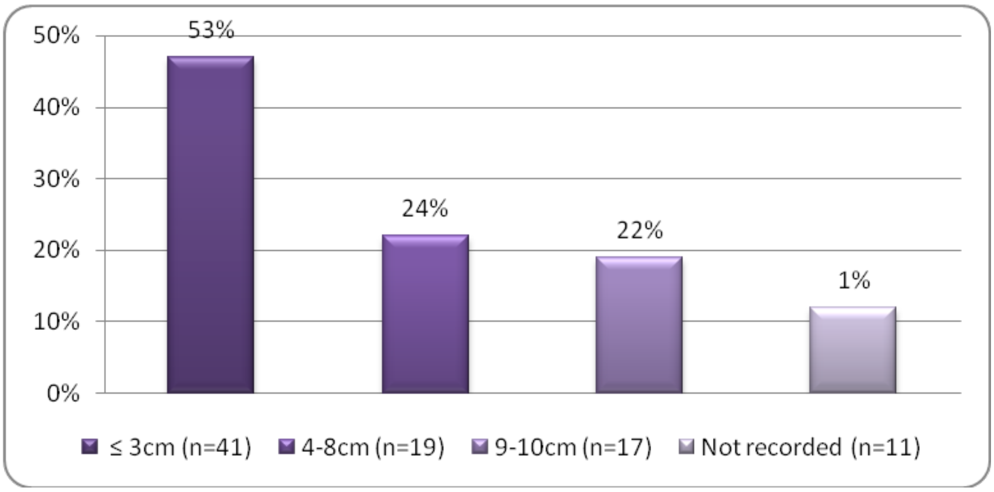

Figure 4.46

Dilatation of the cervix (n=78)

The researcher found that the majority of the 78 mothers (53% (n=41)) were admitted in the latent phase of labour, while 24% (n=19) of the mothers admitted were 4–8 cm dilated. Twenty-two percent (n=17) of the mothers were admitted in the second stage of labour (9–10 cm dilated). In only 1% (n=1) of the cases was there no record of the dilatation of the cervix.

Figure 4.47 shows the neonatal deaths in relation to cervical dilatation of the 78 mothers on admission.

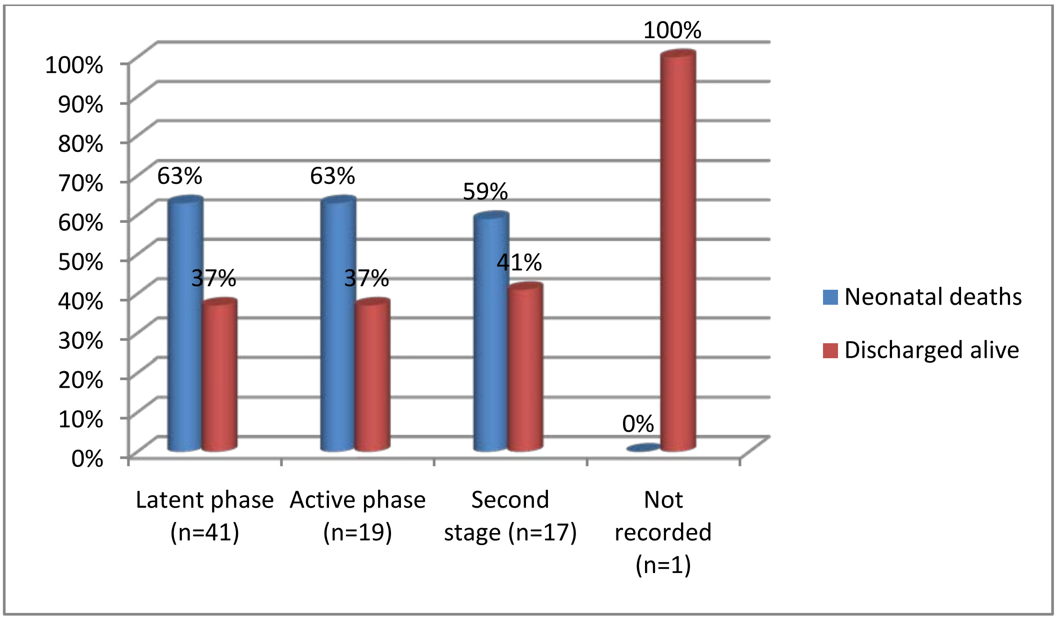

Figure 4.47

Neonatal deaths in relation to the phase of labour on admission (n=78)

Of the 41 mothers who were admitted in the latent phase of labour, 63% (n=26) experienced neonatal deaths and 37% (n=15) of the babies were discharged alive.

Of the mothers who were admitted in the active phase of labour (n=19), 63% (n=12) experienced neonatal deaths and 37% (n=7) of the babies were discharged alive.

Fifty-nine percent (n=10) of the mothers who were admitted in the second stage of labour (n=17) experienced neonatal deaths and in 41% (n=7) the babies were discharged alive.

In the case of the one mother where there was no record of the dilatation of the cervix, the baby was discharged alive (100%).

The researcher found no significant difference in the phase of labour of labour on admission and neonatal deaths.

Rupture of membranes

Of the 78 mothers admitted it was found that 67% (n=52) were admitted with membranes intact, while 24% (n=19) were admitted with spontaneous rupture of the membranes. In 3% (n=2) of the mothers, the membranes were ruptured artificially on admission and in 6% (n=5) mothers there was no record of whether the membranes had ruptured on admission.

Condition of liquor

Figure 4.48 shows that 26 mothers had rupture of membranes including those where there was no record of rupture of membranes. Thirty-eight percent (n=10) had clear liquor, 8% (n=2) had meconium-stained liquor and 4% (n=1) had an offensive liquor. There was no record of the condition of liquor in 50% (n=13) of the mothers.

Of the mothers who had clear liquor (n=10), 60% (n=6) experienced neonatal deaths and in 40% (n=4) the babies were discharged alive.

Both the mothers who had meconium-stained liquor experienced neonatal deaths (100%), while in the 13 mothers where there was no record of the condition of the liquor, 85% (n=11) experienced neonatal deaths and 15% (n=2) of the babies were discharged alive.

Figure 4.48 shows the condition of liquor on admission of mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

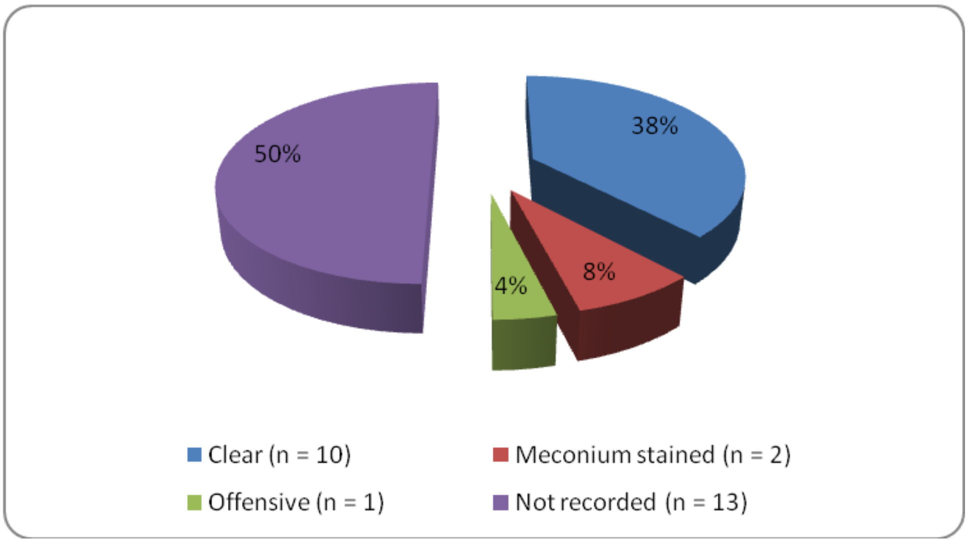

Figure 4.48

Condition of liquor on admission (n=26)

Duration of rupture of membranes

Figure 4.49 depicts the duration of the rupture of the membranes on admission of the 26 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

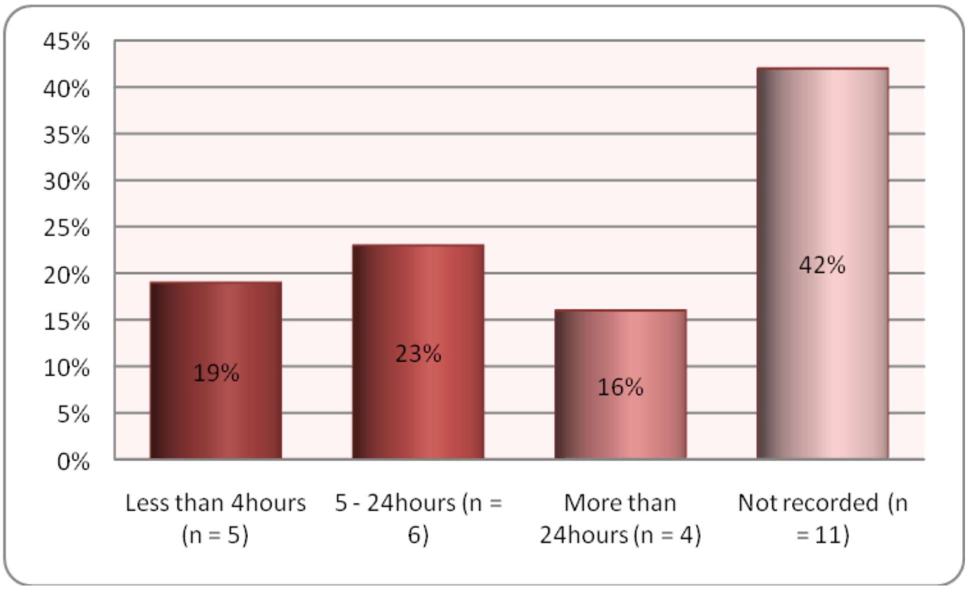

Figure 4.49

Duration of rupture of membranes (n=26)

Figure 4.50 illustrates the relationship between the duration of the rupture of the membranes and the incidence of neonatal deaths.

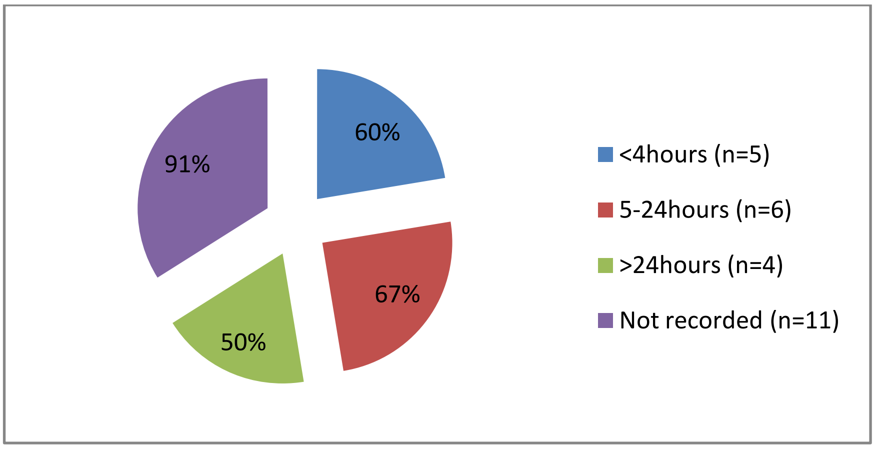

Figure 4.50

Neonatal deaths in relation to duration of rupture of membranes (n=26)

Neonatal deaths occurred in 60% (n=3) of the mothers whose membranes ruptured for less than four hours (n=5); 40% (n=2) of the babies were discharged alive.

Sixty-seven percent (n=4) of the mothers whose membranes ruptured for between five and 24 hours (n=6) experienced neonatal deaths; 33% (n=2) of the babies were discharged alive.

Of the mothers whose membranes ruptured for more than 24 hours (n=4), 50% (n=2) experienced neonatal deaths and 50% (n=2) babies were discharged alive.

In the 11 mothers who had no record of the duration of the rupture of their membranes 91% (n=10) experienced neonatal deaths and one of the babies (9% (n=1)) was discharged alive.

According to the study done by Oboro et al (2006:741), pre-labour rupture of membranes had a high adverse neonatal outcome when the mother developed chorioamnionitis (34%), as compared to those cases where the mothers did not (13%).

Presenting part

Table 4.38 indicates the findings on the vaginal examination of the mothers on admission.

Table 4.38 Findings on vaginal examination (n=78)

Findings on vaginal examination		Frequency	Percentage (n=78)
Presenting part	Vertex	60	77%
	Breech	1	1%
	Compound presentation	1	1%
	Not recorded	16	21%
	Total	**78**	**100%**
Position	Anterior position	52	67%
	Not recorded	26	33%
	Total	**78**	**100%**
Moulding	Absent	62	80%
	Parieto-parietal	5	6%
	Not recorded	11	14%
	Total	**78**	**100%**
Caput	Absent	63	81%
	Present	3	4%
	Not recorded	12	15%
	Total	**78**	**100%**

The researcher found that the majority (77% (n=60)) of the 78 mothers who were subjected to a vaginal examination on admission, presented with vertex, while 1% (n=1) presented with breech and 1% (n=1) presented with compound presentation. In 21% (n=16) of the mothers there was no record of the presenting part.

Position

In this study, the researcher found that of the 78 mothers 67% (n=52), had anterior positions, and in 33% (n=26) there was no record of the position of the foetus.

Moulding

In the 78 mothers who were subjected to a vaginal examination on admission, the moulding was absent in 80% (n=62) of the foetuses. The parieto–parietal moulding was recorded in 6% (n=5) and there was no record in 14% (n=11) of the cases.

Caput

The caput was assessed in 78 mothers and found to be absent in 81% (n=63) of the foetuses and in 4% (n=3) there was no record of caput in 15% (n=12) of the foetuses.

These findings do not show any significant variations between neonatal deaths and babies who were discharged alive.

Descent of the foetal head

Table 4.39 shows the descent of the foetal head on admission of the mothers.

Table 4.39 Descent of foetal head on admission of the mothers (n=78)

Descent	Frequency	Percentage (n=78)
- 1 station	57	73%
0 station	10	13%
+1 station	3	4%
Not recorded	8	10%
Total	**78**	**100%**

It is evident from table 4.39 that in most of the mothers admitted (n=78), a -1 foetal head height accounted for 73% (n=57), while in 13% (n=10) the foetal head was at 0 station and in only 4% (n=3) was the foetal head was at +1 station. In 10% (n=8) of the mothers there was no record of the descent of the foetal head.

4.3.3.21 Pelvic assessment

A pelvic assessment was done in 62% (n=48) of the mothers on admission (n=78). There was no record of a pelvic assessment in the remaining 38% (n=30).

In the 48 mothers on whom a pelvic assessment was performed it was found that 84% (n=40) had an adequate pelvis, and that in 8% (n=4) the pelvis was borderline. There was no record of the findings of the pelvic assessment in 8% (n=4).

Pearson, Larsson, Fauveau and Stadley (2006:66) state that not all complications can be predicted through risk screening, but that with essential preventive care, proper management of labour, and timely management of complications, obstetric and newborn complications can be prevented.

According to Frazer et al (2006:429) the midwife should keep a record of all the findings and management of labour as the records of the client are legal documents and must be accurate.

4.3.3.22 Results of investigations

Urine analysis

Table 4.40 shows the urine analysis of the mothers on admission.

Table 4.40 Urinalysis on admission (n=88)

Urine analysis	Frequency	Percentage (n = 88)
Protein only	4	5%
Protein and glucose	1	1%
Protein and blood	5	6%
Protein , blood and ketones	1	1%
Protein and leucocytes	3	3%
Protein, blood and leucocytes	2	2%
Blood only	4	5%
Blood and ketones	2	2%
Blood and leucocytes	1	1%
Ketones	4	5%
Ketones and leucocytes	1	1%
Leucocytes	3	3%
Normal	31	35%
Not recorded	26	30%
Total	**88**	**100%**

Table 4.40 indicates that the urine of 35% (n=31) of the 88 mothers who were admitted in labour was normal.

Thirty percent (n=26) of the mothers had no record of urine results. Protein and blood was present in the urine of 6% (n=5) of the mothers, while protein, blood and leucocytes combined were present in 29% (n=26).

Blood results if not booked

There were 50 mothers who were admitted while in labour without antenatal information. In 84% (n=42) of the cases, there were no records of blood investigation. Blood investigations were done, i.e. haemoglobin (12% (n=6)), blood grouping (2% (n=1)) and VDRL was collected in 2% (n=1) of the mothers respectively but there were no results for the blood tests done.

Blood tests need to be done before delivery to identify risk factors like anaemia or HIV, since mothers who test positive for these are at a higher risk of intrauterine growth restriction, preterm delivery and low birth weight (Bodkin et al 2006:738).

4.3.4 Section D – Intrapartum care

London et al (2011:200) define intrapartum care as the care given to pregnant women from the onset of labour until the birth of the infant and placenta.

Section D analysed the care of the mother during labour with regard to both the latent and the active phase of labour, taking into consideration the maternal condition, progress of labour and foetal condition.

4.3.4.1 Partogram use

A Partogram is an effective measure of recording the progress of labour graphically as stated by Fraser et al (2011:456).

All observations, fluid intake and output, and medication are entered on the Partogram to assess the progress of labour and the condition of the mother and the foetus (DoH 2007:36).

The Partogram was used on 53% (n=47) of the 88 mothers who were admitted in labour. It was not used in 40% (n=35) of cases and there was no record of Partogram use in 7% (n=6) of the mothers.

Figure 4.51 depicts the use of the Partogram on those mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

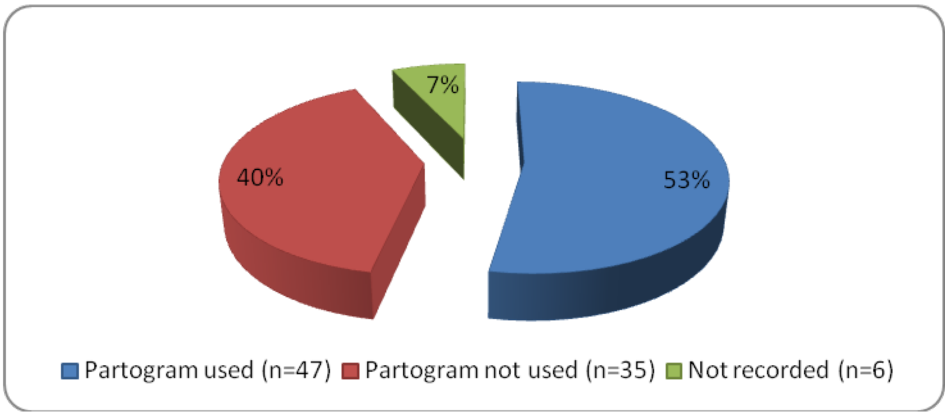

Figure 4.51

The use of the Partogram (n=88)

In the 47 cases where the Partogram was used, 62% (n=29) of the mothers experienced neonatal deaths and 38% (n=18) of the babies were discharged alive.

In the 41 cases where the Partogram was not used, 61% (n=25) of the mothers experienced neonatal deaths and in 39% (n=16) of the babies were discharged alive.

Table 4.41 shows the relationship between Partogram use and neonatal deaths.

Table 4.41 Neonatal deaths in relation to Partogram use (n=88)

Partogram use	Neonatal deaths		Babies discharged alive		Total	
	n	%	n	%	n	%
Yes	29	62%	18	38%	**47**	**53%**
No	25	61%	16	39%	**41**	**47%**
Total	**54**	**61%**	**34**	**39%**	**88**	**100%**

4.3.4.2 Latent phase of labour monitoring

The latent phase refers to the phase when the woman is in labour and the cervix is less than 3-4 cm dilated and more than 1 cm long. During this phase the blood pressure, pulse rate and temperature are checked four-hourly, uterine contractions and foetal heart rate are assessed two-hourly and vaginal examinations assessed four-hourly. Any change in condition warrants more frequent observation (DoH 2007:36).

Figure 4.52 indicates the relation of neonatal deaths to monitoring of labour.

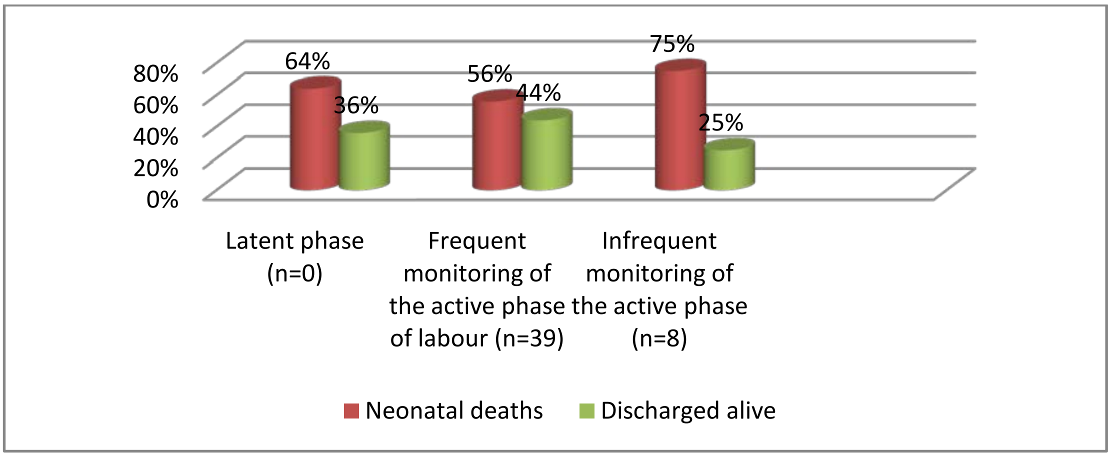

Figure 4.52

Neonatal deaths in relation to monitoring of labour (n=47)

In the 47 cases where the Partogram was used, the latent phase of labour was never monitored (100%).

In the 47 cases where the Partogram was used, 64% (n=30) of the mothers experienced neonatal deaths and 36% (n=17) of the babies were discharged alive.

These results are consistent with the findings of Pearson et al in the *Opportunities of Africa's Newborns* (2006:66) who stated that data and experience across Africa suggest that although the Partogram is a well-known intervention for monitoring the progress of labour, it is often not used or not used correctly.

4.3.4.3 Active phase of labour

The active phase is the phase during which the woman is in labour and the cervix is more than 3–4 cm dilated and less than 1 cm long (DoH 2007:36).

Table 4.42 shows the monitoring of the active phase of labour.

Table 4.42 Monitoring of the active phase of labour (n=47)

Labour monitoring	Frequency	Percentage (n=47)
Frequently	39	83%
Infrequently	8	17%
Total	**47**	**100%**

The researcher found that in the 47 cases where the Partogram was used, the active phase of labour was monitored frequently in 83% (n=39) and infrequently in 17% (n=8).

In the 39 cases where the active phase was monitored frequently, neonatal deaths occurred in 56% (n=22), and in 44% (n=17) of the babies were discharged alive as indicated in figure 4.52 above.

Seventy-five percent (n=6) of the mothers who were monitored infrequently (n=8) experienced neonatal deaths and 25% (n=2) of the babies were discharged alive as indicated in figure 4.52 above.

The existing literature (Pearson et al 2006:66) is consistent with the findings of this study.

4.3.4.4 Maternal condition

During the active phase of labour the maternal condition is assessed because the psychological and physical wellbeing of the mother is essential for the normal progress of labour. Blood pressure and heart rate are checked hourly. Temperature is checked four-hourly and urine volume and testing are done two-hourly (DoH 2007:36).

The maternal condition was monitored frequently in 83% (n=39) of the mothers, while in 15% (n=7) the condition was monitored infrequently and the condition was not monitored at all in 2% (n=1) of the mothers.

Blood pressure monitoring

Figure 4.53 shows the way in which the blood pressure was monitored during the active phase of labour in the 47 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

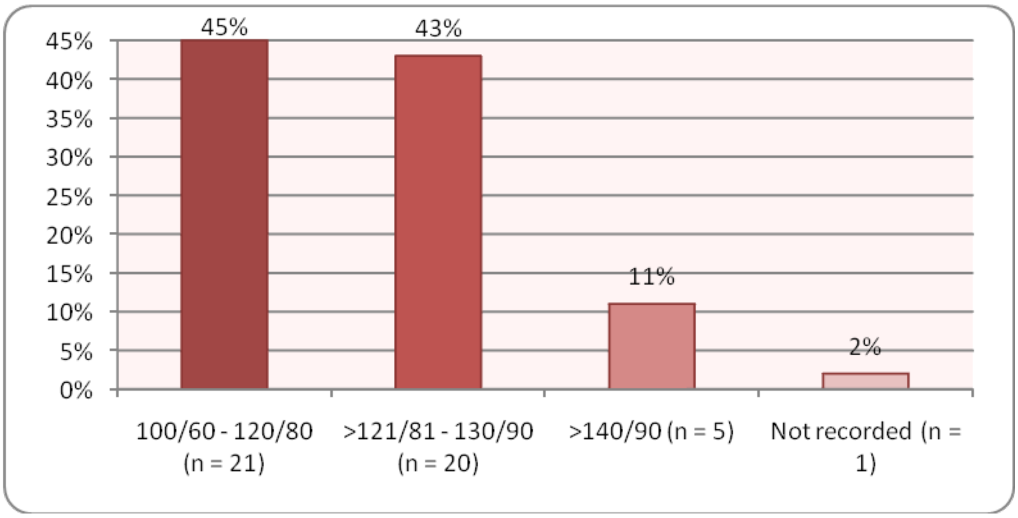

Figure 4.53

Blood pressure monitoring (n=47)

As may be seen from figure 4.53, the blood pressure of 45% (n=21) of the mothers ranged between 100/60 ad 120/80 mmHg, 42% (n=20) of the mothers had blood pressure ranging between 121/81 and 130/90 mmHg and 11% (n=5) of the mothers had blood pressure above 140/90 mmHg. The blood pressure of 2% (n=1) of the mothers was not recorded.

Temperature monitoring

Figure 4.54 depicts the monitoring of body temperature during the active phase of labour in the 47 mothers whose babies were admitted to the neonatal unit during the months of January to December 2009.

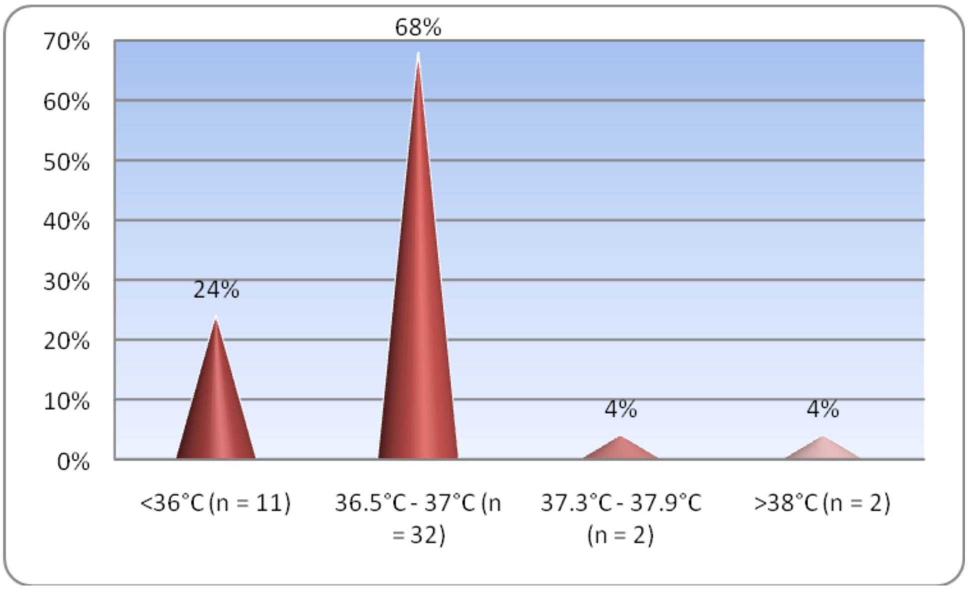

Figure 4.54

Temperature monitoring (n=47)

It is evident from figure 4.54 that the temperature of the majority of the mothers (68% (n=32)) was normal; 4% (n=2) of the mothers had a mild to severe fever, i.e. temperature of 37.3–37.9°C; and 4% (n=2) had a temperature of above 38°C. Twenty-four percent (n=1) of the mothers had a temperature of below 36°C.

Table 4.43 shows the relationship between neonatal deaths and maternal temperature.

Of the mothers whose temperature was below 36°C (n=11), 91% (n=10) experienced neonatal deaths and 9% (n=1) of the babies were discharged alive.

Table 4.43 Neonatal deaths in relation to maternal temperature (n=47)

Temperature measurement	Neonatal deaths		Babies discharged alive		Total n=47	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
<36ºC	10	91%	1	9%	**11**	**100%**
36.5ºC-37.2ºC	16	50%	16	50%	**32**	**100%**
37.3ºC-37.9ºC	1	50%	1	50%	**2**	**100%**
>37.9ºC	2	100%	0	0%	**2**	**100%**
Total	**29**	**62%**	**18**	**38%**	**47**	**100%**

Fifty percent (n=32) of the 32 mothers who had normal temperature, experienced neonatal deaths and 50% (n=16) of the babies were discharged alive. One of the mothers whose temperature was between 37.3°C-37.9°C, 50% (n=1) experienced neonatal death and the other baby (50% (n=1)) was discharged alive.

The babies of both mothers with a temperature of above 37.9°C died (100% n=2).

In their study of risk factors for maternal intrapartum fever and short-term neonatal outcome in the Sheba Medical Center, Maayan-Metzger et al (2006:171) state that babies born to mothers with fever during labour were more likely to have meconium-stained amniotic fluid and were symptomatic in the first hours after birth though they did not exhibit any difference from the non-fever group after 24 hours. Risk factors for developing fever during labour were found to be prolonged labour, first labour, maternal disease and the duration of membrane rupture. In this study, factors predisposing to fever were not assessed.

Urinalysis

It is apparent from table 4.44 that of the 47 mothers where the Partogram was used, 47% (n=22) had normal urine, while protein, blood and ketones were found in 40% (n=19) of the mothers. In 13% (n=6) of the mothers there was no record of the urine results.

Table 4.44 shows the urine analysis during the active phase of labour.

Table 4.44 Urinalysis during the active phase of labour (n=47)

Urine analysis	Frequency	Percentage (n=47)
Protein only	2	4%
Protein and blood	3	7%
Protein and ketones	1	2%
Protein, blood and ketones	1	2%
Protein , glucose and ketones	1	2%
Blood and ketones	2	4%
Blood only	4	9%
Ketones	3	6%
Leucocytes	2	4%
Normal	22	47%
Not recorded	6	13%
Total	**47**	**100%**

In the 47 cases where the Partogram was used, the urine volume was ≥30 ml/hour in 45% (n=21), 4% (n=2) of the mothers had a urinary output of less than 30 ml/hour and in 51% (n=24) there was no record of the volume of urine.

4.3.4.5 Foetal monitoring

Foetal monitoring is important during labour to identify the foetal response to labour. During the active phase the foetal heart rate is assessed half-hourly – before, during and after contractions. The colour and odour of the liquor are assessed two-hourly if the membranes have ruptured (DoH 2007:36).

The foetal condition was monitored frequently in 83% (n=39) of the mothers, while it was monitored infrequently in 17% (n=8).

Figure 4.55 indicates the incidence of neonatal deaths in relation to foetal monitoring.

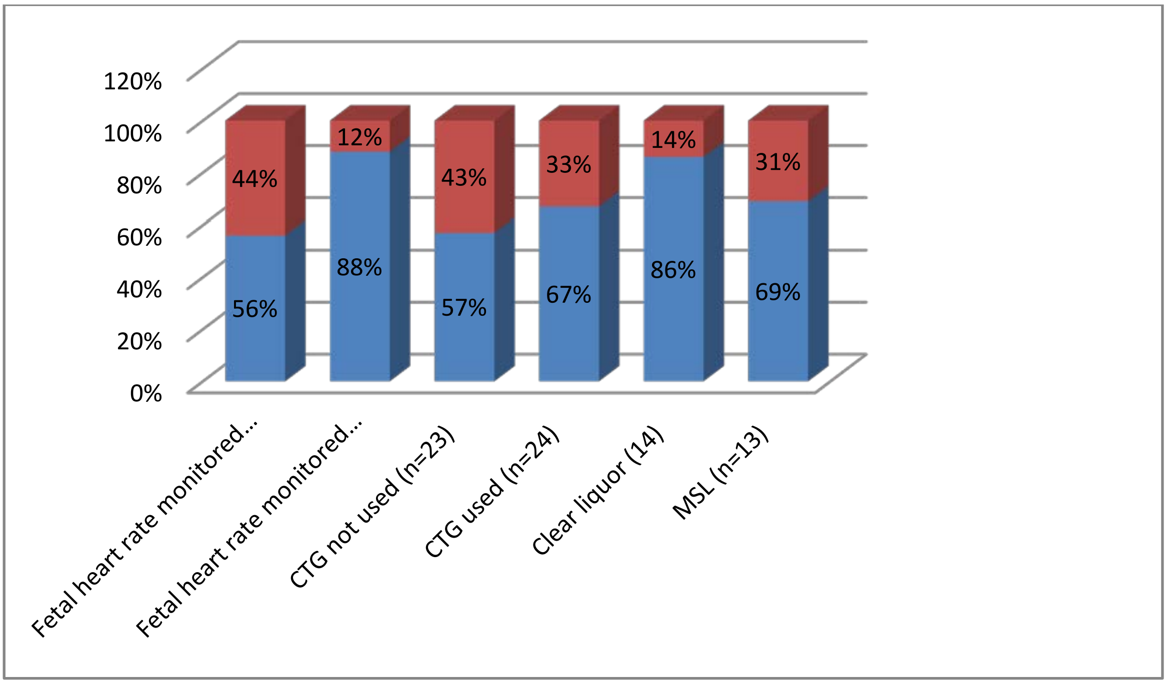

Figure 4.55

Neonatal deaths in relation to foetal monitoring (n=47)

Of the 39 cases where the foetal heart function was monitored frequently, 56% (n=22) experienced neonatal deaths and in 44% (n=17) of cases the babies were discharged alive.

In the eight cases where the foetal heart was not monitored, 88% (n=7) of the babies died and 12% (n=1) were discharged alive.

Table 4.45 depicts the foetal monitoring of the 47 mothers during the active stage of labour.

Table 4.45 Foetal monitoring during the active stage of labour (n=47)

Foetal monitoring	**Frequency**	**Percentage (n=47)**
120-160 b/m	41	87%
<120 b/m	2	4%
>160 b/m	4	9%
Total	**47**	**100%**

The foetal heart rate was between 120 and 160 b/min in 87% (n=41) of the cases, below 120 b/min in 4% (n=2) and above 160 b/min in 9% (n=4).

The cardiotocograph was used for foetal monitoring in 51% (n=24) of the cases and not used in 49% (n=23).

In 67% (n=16) of the cases where the foetal heart was monitored by cardiotocograph (n=24), the mothers experienced neonatal deaths, and the babies were discharged alive in 33% (n=8). See figure 4.55.

In the cases where the cardiotocograph was not used to monitor the foetal heart (n=23), 57% (n=13) of the mothers experienced neonatal deaths and 43% (n=10) of the babies were discharged alive. See figure 4.55.

The results are consistent with findings in the study done by Velaphi and Pattinson (2007:103) who found that inadequate monitoring and poor use of the Partogram were the most common avoidable factors related to health workers.

The condition of the liquor was documented in 27 mothers. The liquor was clear in 52% (n=14) of the mothers, and was meconium-stained in 48% (n=13).

Of the mothers whose liquor was clear (n=14), 86% (n=12) experienced neonatal deaths and 14% (n=2) of the babies were discharged alive. See figure 4.55.

The incidence of neonatal deaths in the mothers who had meconium-stained liquor (n=13) was 69% (n=9), and 31% (n=4) of the babies were discharged alive. See figure 4.55.

The results of this study consistent with the findings in the study done by Khazardoost, Hantoushzadeh, Khooshideh and Borna (2007:578) who found that meconium aspiration syndrome occurs in 21.2% of infants born through meconium-stained amniotic fluid and that thick meconium increases the risk of an adverse neonatal outcome.

4.3.4.6 Progress of labour

The Partogram is used to record and assess the progress of labour. Any deviations from the norm can easily be identified on the Partogram. The following should be recorded on the Partogram: frequency and strength of uterine contractions which are checked hourly, the level of the presenting part, cervical dilatation, caput and parieto-parietal moulding and the condition of membranes which are assessed two-hourly (DoH 2007:36).

In the 47 cases where the Partogram was employed, the progress of labour was monitored regularly in 85% (n=40) and infrequently in 15% (n=7).

Fifty-eight percent (n=23) of the 40 mothers who were monitored frequently experienced neonatal deaths and 42% (n=17) of the babies were discharged alive.

Of the mothers who were monitored infrequently (n=7), 86% (n=6) experienced neonatal deaths and 14% (n=1) of the babies were discharged alive.

The contractions were found to be moderate in 6% (n=3) of the mothers and strong in 94% (n=44) of the mothers, as indicated on the table 4.11.

Table 4.46 shows the contractions of mothers during labour.

Table 4.46 Contraction during labour (n=47)

Contractions	Frequency	Percentage (n=47)
None	0	0%
Mild	0	0%
Moderate	3	6%
Strong	44	94%
Not recorded	0	0%
Total	**47**	**100%**

In the 47 mothers whose progress was plotted on the Partogram, the level of the presenting part was found to be at -4 station in 49% (n=23), at 0 station in 40% (n=19), at +1station in 4% (n=2) of the mothers and at +2 station in 7% (n=3).

Table 4.47 shows the dilatation of the 47 mothers whose progress was monitored. The cervix was dilating at 1 cm per hour in primigravid in 11% (n=5) of the mothers, 2 cm per hour in multipara in 2% (n=1) of the mothers. Thus it was less than the expected in 25% (n=12), and more than expected in 62% (n=29).

Table 4.47 shows the dilatation of the mothers who were monitored.

Table 4.47 Cervical dilatation of mothers monitored (n=47)

Cervical dilatation	**Frequency**	**Percentage (n=47)**
1 cm/hour in primipara	5	11%
2 cm/hour in multipara	1	2%
Less than expected	12	25%
More than expected	29	62%
Total	**47**	**100%**

The caput was absent in 77% (n=36) of the mothers, present in 21% (n=10) and was not recorded in 2% (n=1).

The mean for the moulding was 1.4, with a standard deviation of 0.8, while the standard error mean was 0.1; the upper mean 1.6 and the lower mean was 1.2. The upper quartile was 2.0 with the lower quartile at 1.0.

Of the 53 mothers who were not monitored, 58% (n=31) experienced neonatal deaths and 42% (n=22) of the babies were discharged alive.

According to Pearson et al (2006:66), when a Partogram has been used to manage labour, research has shown improvement in foetal and newborn survival and reductions in unnecessary interventions. The Partogram helps to identify slow progress in labour; oxytocin infusions can prevent prolonged labour and assisted childbirth in obstructed labour.

The findings in this study show that the Partogram is not consistently used to monitor labour.

4.3.4.7 Treatment given during labour

All medication and intravenous solutions given to the mother, for whatever reason, should always be recorded. All medication and fluids administered, by whatever route, should always be recorded (DoH 2007:36).

Medication was given to 21 of the mothers during labour, i.e. antibiotics were given to 10% (n=2) of the mothers, oxytocin to10% (n=2), and intravenous fluids to 80% (n=17).

4.3.4.8 Problems identified during labour

After all the assessments and evaluations, a short summary of problems identified and proposed management of these problems should be given (DoH 2007:36).

Figure 4.56 depicts the problems identified during the active phase of labour in the mothers whose babies were admitted to the neonatal unit during the months of January 2009 to December 2009.

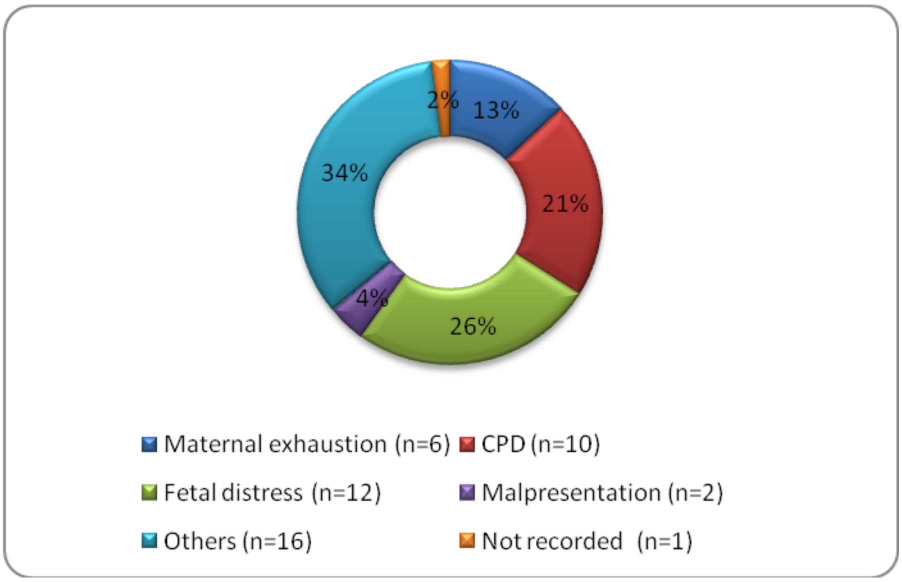

Figure 4.56

Identified problems (n=47)

Figure 4.56 indicates that most of the mothers had experienced problems: foetal distress accounted for 26% (n=12) of these, followed by other complications which accounted for 34% (n=16). Cephalopelvic disproportion accounted for 21% (n=10), maternal exhaustion and malpresentation accounted for 13% (n=6) and 4% (n=2) respectively.

Figure 4.57 shows that of the 16 other problems identified, cord prolapse accounted for 6% (n=1), elderly primigravid for 6% (n=1), failed induction for 6% (n=1), HIV positive for 13% (n=2), maternal infection for 6% (n=1), meconium-stained liquor for 13% (n=2), multiple pregnancy for 6% (n=1), poor progress for 32% (n=5), preterm labour for 6% (n=1) and prolonged 1st stage of labour for 6% (n=1).

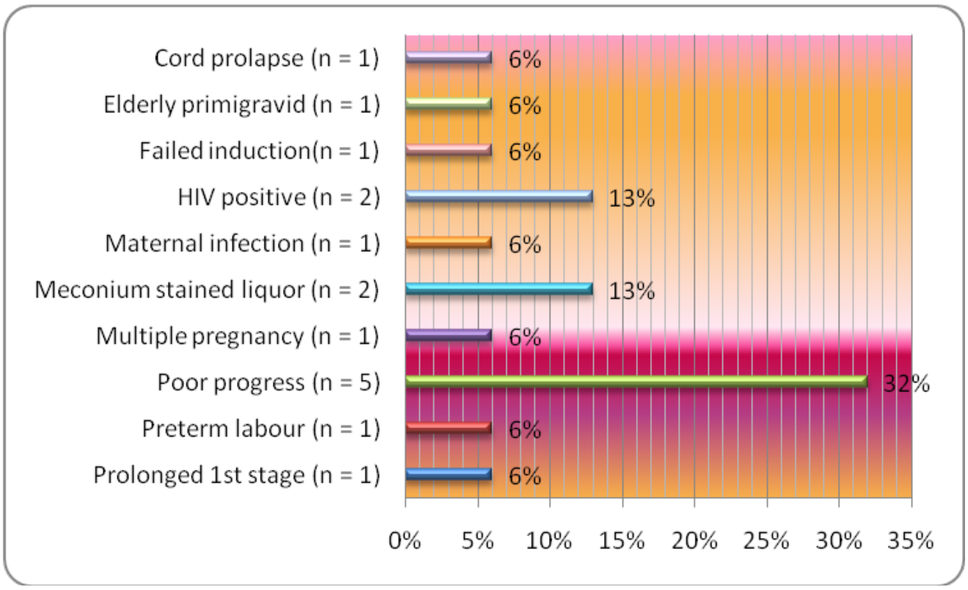

Figure 4.57

Other problems that were identified (n=16)

The results of the study are consistent with the findings in the study done by Ngoc et al (2006:701) who found that the primary obstetric causes of perinatal deaths are antepartum haemorrhage, spontaneous preterm labour, intra-partum related infections, hypertensive disorders, maternal disease, intrauterine growth restriction and other unknown causes.

4.3.4.9 Proposed management

Of the 46 mothers who were identified as having problems, 68% (n=32) were referred to the doctor, while 30% (n=14) were not referred and only in 2% (n=1) was there no record of referral.

Of the 32 mothers who were referred to the doctor, 59% (n=19) experienced neonatal deaths and 41% (n=13) of the babies were discharged alive.

Sixty-seven percent (n=10) of the mothers who were not referred (n=15) experienced neonatal deaths, while in 27% (n=4) the babies were discharged alive. Six percent (n=1) of the mothers who were not referred to the doctor experienced neonatal deaths.

Velaphi and Pattinson (2007:104) found that monitoring the foetus during labour, use of the Partogram and management of labour were the main areas in which health workers were inadequate in delivering appropriate obstetric care. They established, further, that poor monitoring of the foetus during labour was associated with poor outcome even in pregnancies considered to be low-risk.

4.3.5 Section E – Management of the second stage

The second stage commences when the cervix reaches full dilatation (10 cm) up to two hours before the mother starts to bear down. The head should be allowed to descend onto the pelvic floor if foetal distress and cephalopelvic disproportion have been ruled out. The bladder should be emptied. Observations of the first stage of labour should continue. Bearing down should be encouraged only when the foetal head starts to distend the perineum and the mother has an urge to push (DoH 2007b:40).

In this section, the researcher examined the management of the second stage of labour including the condition of the baby immediately after delivery.

4.3.5.1 Method of delivery

Figure 4.58 shows that of the 93 mothers who delivered in the hospital, 77% (n=72) delivered vaginally and 23% (n=21) were delivered by Caesarean section.

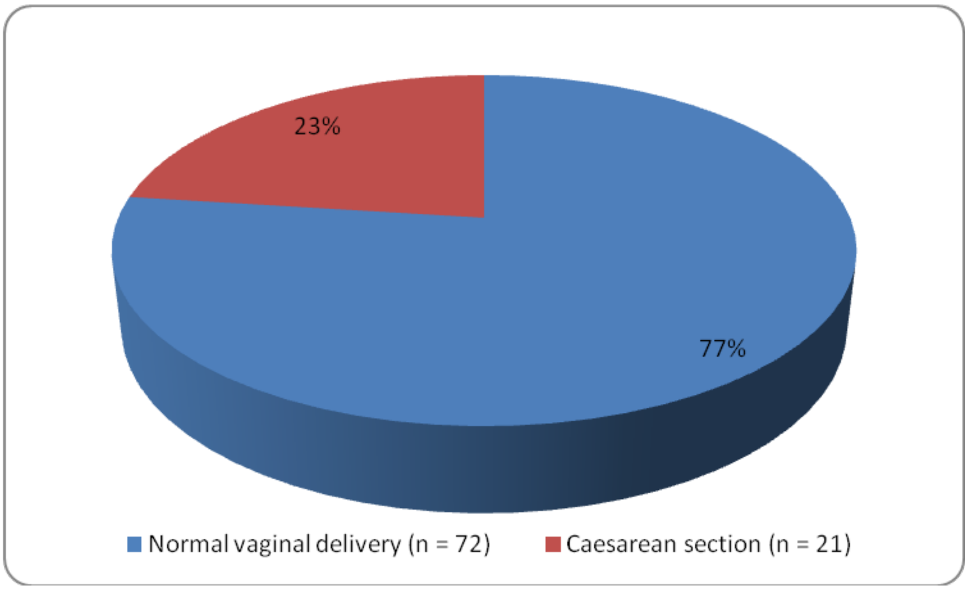

Figure 4.58

Method of delivery (n=93)

Of the 72 mothers who delivered vaginally, 63% (n=45) of the mothers experienced neonatal deaths and 37% (n=27) of the babies were discharged alive.

Of the 21 mothers who delivered by caesarean section, 67% (n=14) of the mothers experienced neonatal deaths and 33% (n=7) of the babies were discharged alive.

The researcher identified found no significant difference in the mode of delivery with regard to the neonatal deaths.

In their study of neonatal mortality for primary caesarean and vaginal births to low-risk women in United States of America, MacDorman, Declercq, Menacker and Malloy (2008:8) found that caesarean deliveries with no labour complications or procedures remained at 69% higher risk of neonatal mortality than planned vaginal deliveries.

Tan, Subramaniam and Omar (2007:34), in their study in the United States of America on labour and perinatal outcome in women at term with one previous lower-segment caesarean, state that women with a successful vaginal birth had a better outcome in respect of blood loss, blood transfusion requirement, prolonged hospital stay and neonatal admission than those delivered by emergency caesarean section, which has more operative complications and neonatal admissions.

4.3.5.2 Apgar scoring assessment at one minute and five minutes

All newborn babies should be assigned an Apgar score at one and five minutes after delivery to determine whether the baby may need resuscitation or not (DoH 2007:57).

Eighty-nine mothers had a complicated delivery. Twelve percent (n=11) of the babies had an Apgar score of below 3/10, 45% (n=40) accounted for an Apgar score between 3/10 and 6/10 and 43% (n=38) had Apgar score of above 7/10.

All the babies with an Apgar below 3/10 (100% (n=11)) died; 60% (n=24) of those with an Apgar of 3/10–6/10 (n=40) died and 40% (n=16) of the babies were discharged alive. Fifty-five percent (n=21) of the 38 babies with an Apgar above 7/10 died and 45% (n=17) of the babies were discharged alive.

Of the 89 babies born via complicated deliveries, 61% (n=54) needed resuscitation, 37% (n=33) did not need resuscitation and in 2% (n=2) there was no record of whether the babies needed resuscitation or had been resuscitated.

Table 4.48 shows the resuscitation steps taken in respect of the babies who needed to be resuscitated.

Table 4.48 Resuscitation steps taken (n=54)

Resuscitation steps	Frequency	Percentage (n=54)
Suctioning only	2	4%
Suctioning and bag and mask ventilation	34	63%
Suctioning and intubation	17	31%
Suctioning, bag and mask ventilation, intubation and drugs given	1	2%
Total	**54**	**100%**

It appears from table 4.48 that 54 babies needed resuscitation. Suctioning and bag and mask ventilation were done in 63% (n=34) of the cases while suctioning and intubation was done in 31% (n=17). Suctioning alone was done on 4% (n=2) of babies, while suctioning, bag and mask ventilation, intubation and drugs were given to 2% (n=1) of the babies.

Table 4.49 indicates the neonatal deaths in relation to resuscitation.

Table 4.49 Neonatal deaths in relation to resuscitation (n=89)

Resuscitation	Neonatal deaths		Babies discharged alive		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage (n=89)
Resuscitated	35	65%	19	35%	**54**	**100%**
Not resuscitated	19	58%	14	42%	**33**	**100%**
Not recorded	2	100%	0	0%	**2**	**100%**
Total	**56**	**63%**	**33**	**37%**	**89**	**100%**

Of the 54 babies who needed resuscitation, 65% (n=35) died and 35% (n=19) were discharged alive.

Of the 33 babies who did not need resuscitation, 58% (n=19) died and 42% (n=14) were discharged alive.

Both the babies, in respect of whom there was no record of whether resuscitation was needed, died.

In the 54 babies who needed resuscitation, it was found that in 7% (n=4), of the cases the resuscitation took less than five minutes, in 2% (n=1) cases it needed five to 10 minutes and in 2% (n=1).more than ten minutes The duration of the resuscitation was not indicated in 89% (n=48) of the cases. This is shown in table 4.50.

Table 4.50 shows the duration of resuscitation in babies who were resuscitated.

Table 4.50 Duration of resuscitation (n=54)

Duration of resuscitation	Frequency	Percentage (n=54)
<5 minutes	4	7%
5-10 minutes	1	2%
>10 minutes	1	2%
Not recorded	48	89%
Total	**54**	**100%**

In four of the cases where resuscitation took less than five minutes, only 25% (n=1) of the babies died and 75% (n=3) of the babies were discharged alive.

Both babies who were resuscitated for more than five and ten minutes respectively died.

There was no record of the duration of resuscitation in 48 babies. Of these, 71% (n=34) died and 29% (n=14) were discharged alive.

Figure 4.59 indicates the relationship between neonatal deaths and the duration of the resuscitation.

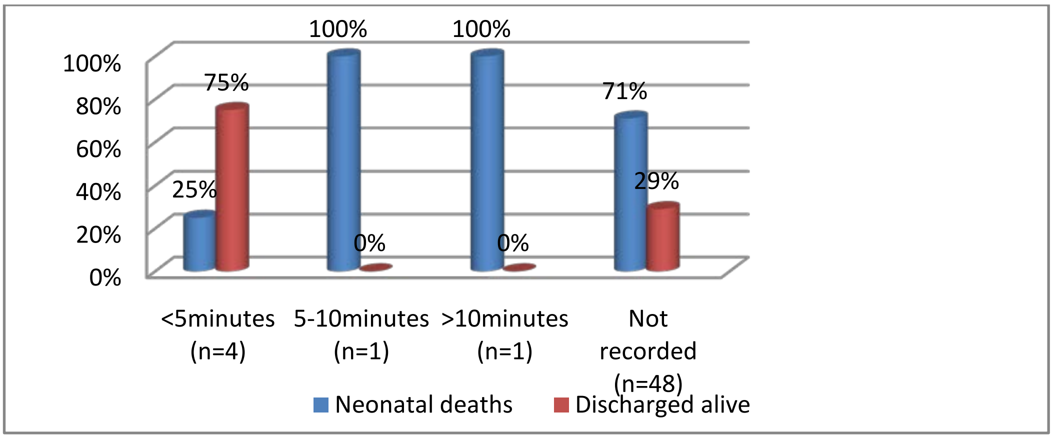

Figure 4.59

Neonatal deaths in relation to duration of resuscitation (n=54)

The findings of the study are consistent with the study done by Lee, Cousens, Wall, Niermeyer, Darmstadt, Carlo, Keenan, Bhutta, Gill and Lawn (2011:S12), who found that immediate assessment and stimulation of the newborn could reduce term intrapartum-related and preterm mortality by 10%.

Berglund, Norman, Grunewald, Pettersson and Cnattingius (2008:719) state that 10% of all newborns require some assistance to adjust to the extrauterine environment, while only 1% need extensive resuscitative measures to survive. The important time is around 10 minutes in cases of severe asphyxia where labour personnel should be available to initiate resuscitation.

4.3.5.3 Prophylactic drugs

If the baby does not need resuscitation, dry the baby, remove wet linen and provide warmth. Clear the airway if there are secretions and maintain warmth by nursing the baby in the kangaroo mother-care position. Start feeds within an hour after birth -- breastfeed unless contraindicated. Conduct a physical examination to look for congenital abnormalities and take measurements (weight, length and head circumference). The DoH recommends that cord care should commence immediately, prophylactic eye ointment should be applied within an hour after birth and vitamin K given within one hour after birth (DoH 2007:58).

Of the babies who were delivered in the hospital (n=93) and on the way to the hospital (n=7), 84% (n=84) were given routine prophylactic drugs, i.e. a Konakion injection was given and eye cleaning was done. Nevirapine was given to 39% (n=5) of the babies of the mothers who were HIV positive when admitted (13%) (n=13) and Azidothymidine (AZT) was administered to 15% (n=2). There was no record in 46% (n=6) of the cases. In 3% (n=3) of the babies born to HIV negative mothers, there was no record of whether routine drugs were given or not.

Of the five babies who were given Nevirapine 40% (n=2) died and 60% (n=3) were discharged alive.

Both the two babies who were given AZT were discharged alive. All nine babies where there was no record of prophylactic drugs died (100%).

The results of the study show an important link between HIV prophylaxis and neonatal survival.

Figure 4.60 shows the prophylactic drugs which were given to the babies after delivery.

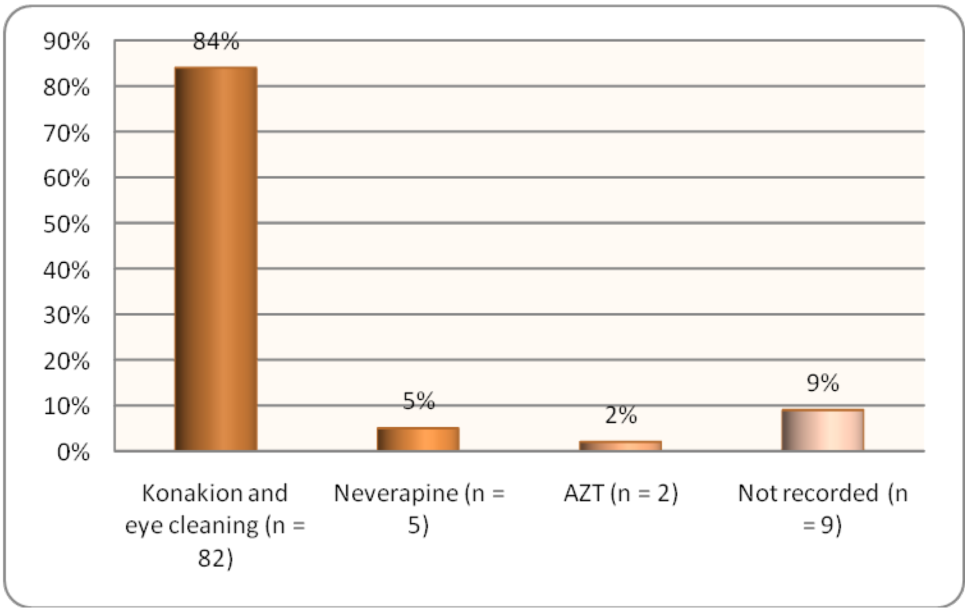

Figure 4.60

Prophylactic drugs given to babies after delivery (n=98)

4.3.5.4 Congenital abnormalities

Congenital abnormalities were recorded in 2% (n=2) of the babies. Both these babies died. The researcher was unable to identify the type of abnormalities as they were not recorded.

Edmond, Quigley, Zandoh, Danso, Hurt, Agyei, and Kirkwood (2008:433) agree with the findings of the study, as they identified congenital abnormalities as one of the causes of the death within a week of life (4.6%).

4.3.5.5 Birth weights

Figure 4.61 indicates the weight categories of the babies.

The birth weight of 94 babies was checked. The researcher found that 56% (n=53) of the babies weighed 2500 g or more, 21% (n=20) weighed between 1000 g and 1499 g, 15% (n=14) between 1500 g and 1999 g and 7% (n=7) between 2000 g and 2499 g.

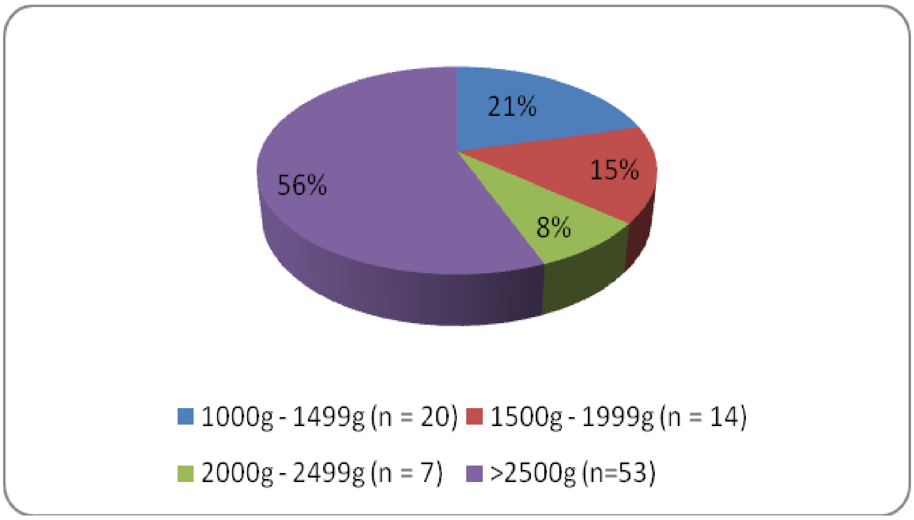

Figure 4.61

Weight categories of the babies (n=94)

Eighty percent (n=16) of the babies weighing less than 1500 g (n=20) died, while 20% (n=4) of the babies weighing less than 1500 g were discharged alive.

Of the 53 babies weighing more than 2500 g, 57% (n=30) died and 43% (n=23) were discharged alive.

Of the babies weighing between 1500 g and 1999 g (n=14), 64% (n=9) died and 36% (n=5) were discharged alive.

The babies weighing between 2000 g and 2499 g (n=7) accounted for 71% (n=5) of neonatal deaths and 29% (n=2) of the babies were discharged alive.

Figure 4.62 indicates the relationship between weight and neonatal deaths.

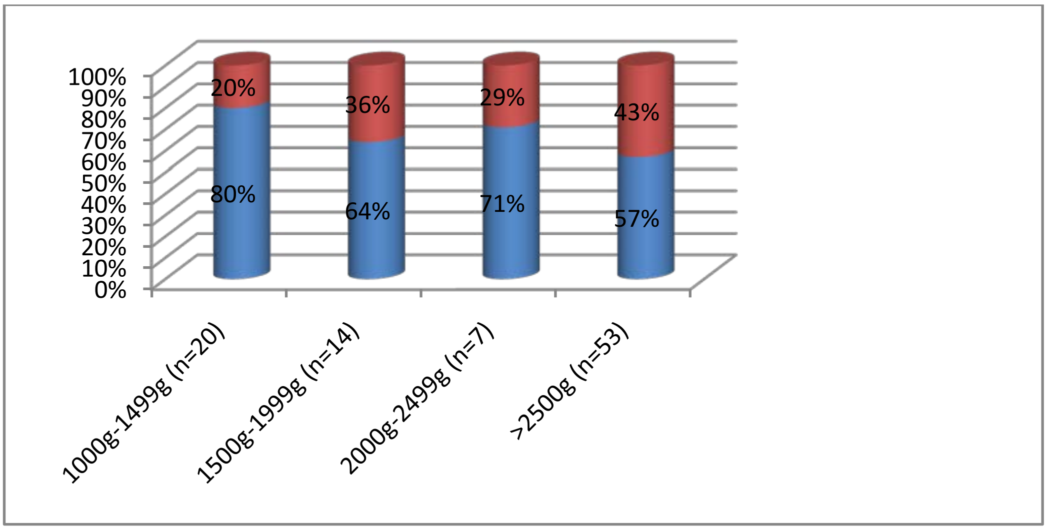

Figure 4.62

Neonatal deaths in relation to birth weight (n=94)

The findings of this study revealed a significant link between birth weight and neonatal deaths. The lower the birth weight the higher the risk of neonatal death.

The results of the study done by Jehan et al (2009:133) tally with the findings of the study as they found that birth weight <2000 g (26.1%) is a risk factor for neonatal death.

4.3.5.6 Duration of labour

Figure 4.63 shows the duration of labour of mothers who delivered in the hospital (n=94). It indicates that 34% (n=32) spent between five and 10 hours in labour, while only 1% (n=1) was in labour for less than four hours, and 10% (n=9) of the mothers spent 11–18 hours in labour. Five percent (n=5) of the mothers were in labour for more than 18 hours. In 50% (n=47) of the cases there was no record of the duration of labour.

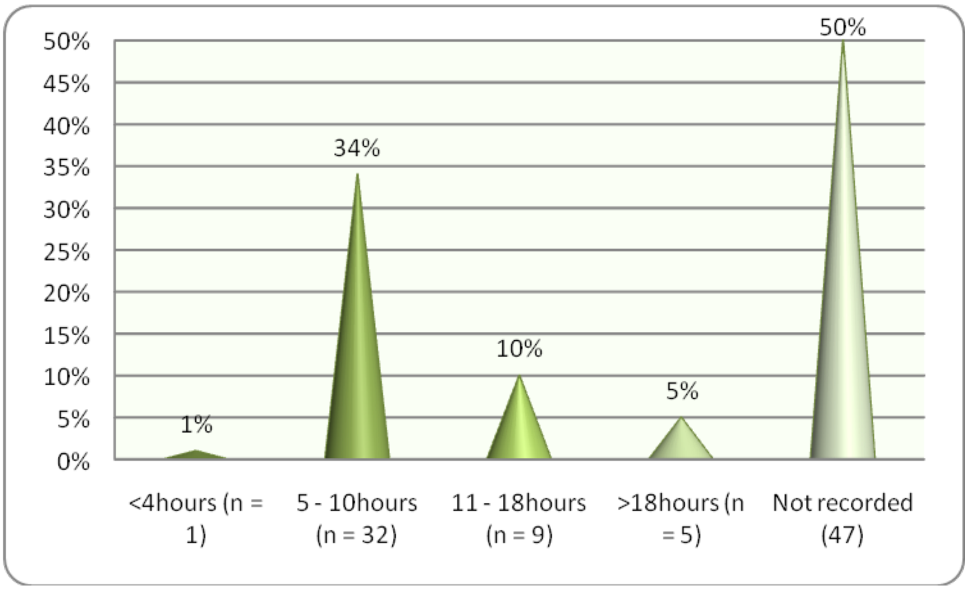

Figure 4.63

Duration of labour (n=94)

Forty-seven percent (n=15) of the mothers who spent five to 10 hours in labour (n=32), experienced neonatal deaths; 53% (n=17) of the babies were discharged alive.

Mothers who were in labour for between 11 and 18 hours (n=9) accounted for 78% (n=7) of neonatal deaths; only 22% (n=2) of the babies were discharged alive.

All the mothers who were in labour for more than 18 hours (n=5) experienced neonatal deaths.

In the case of the mothers where there was no record of the duration of labour (n=47), 70% (n=33) experienced neonatal deaths and 30% (n=14) of the babies were discharged alive.

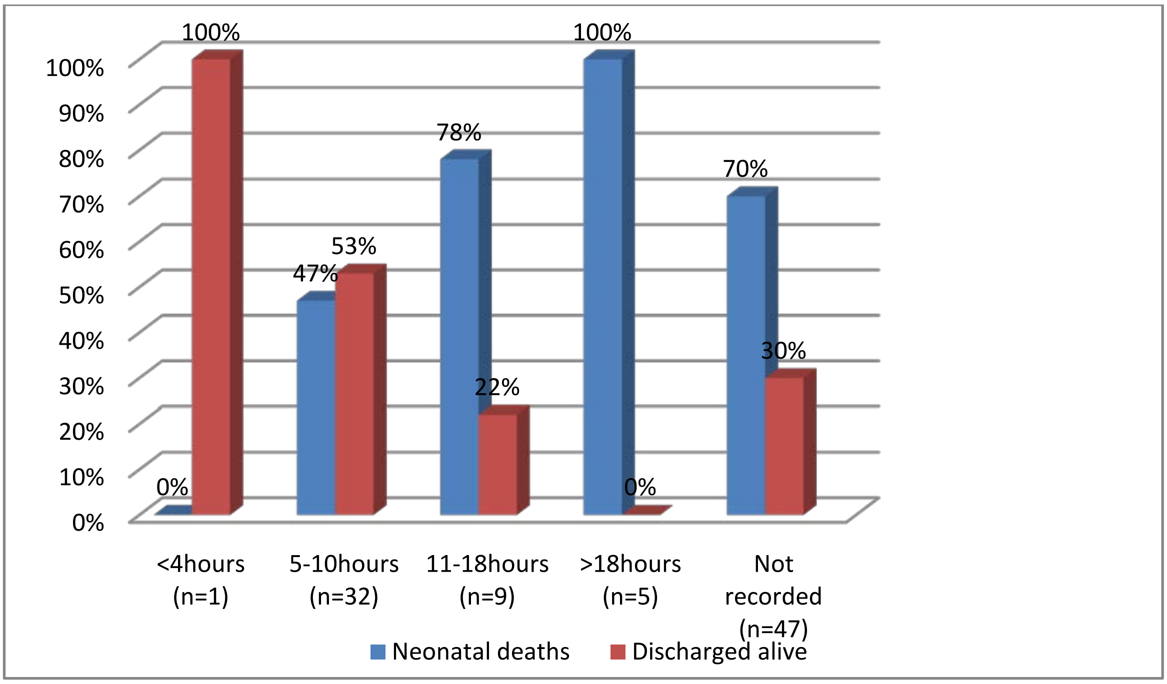

Figure 4.64

Neonatal deaths in relation to duration of labour (n=94)

The results of the study show a significant link between the duration of labour and neonatal deaths. Prolonged labour is shown to be a risk factor in neonatal deaths,

The results of the study are consistent with the findings in the study done by Oboro et al (2006:741) who found that preterm pre-labour rupture of membranes with development of chorioamnionitis is associated with an increased incidence of adverse neonatal outcome.

4.3.5.7 Initiation of breastfeeding

Breastfeeding was initiated in 26% (n=25) of the babies of the 94 mothers, and was not initiated in 60% (n=56). The reasons for not initiating breastfeeding were not indicated. There was no record of the initiation of breastfeeding in 14% (n=13).

4.3.5.8 Maternal blood loss

In 55% (n=52) of the 94 mothers, the maternal blood loss was less than 150 ml between 155 ml and 490 ml in 13% (n=12) of the mothers, and above 500 ml in 2% (n=2) of the mothers. Blood loss was not recorded in the remaining 30% (n=28).

4.3.5.9 Examination of the placenta

The placenta was found to be intact in 85% (n=80) of the 94 mothers, ragged in 4% (n=4) and stained yellow in 3% (n=3). There was no record of the condition of the placenta in the remaining 8% (n=7).

Of the 80 mothers whose placenta was recorded as intact, 60% (n=48) experienced neonatal deaths and 40% (n=32) of the babies were discharged alive.

All the babies of the four mothers whose placenta was ragged died (100%).

Of the mothers whose placenta was stained yellow (n=3), 67% (n=2) experienced neonatal deaths, with only 33% (n=1) of the babies being discharged alive.

Where there was no record of the examination of the placenta (n=7), 86% (n=6) of the mothers experienced neonatal deaths and only 14% (n=1) of the babies were discharged alive.

4.3.6 Section F – Neonatal care

For every baby, whether brought to the health care facility from home, transferred from another institution or ward, or from the labour room due to a complicated birth, the management care involves planning, implementing and evaluating care based on the ongoing assessment of the baby's condition (WHO 2003:F–1).

Section F analysed the age of the baby when admitted, the reason for the admission and the problems on admission, the care given, identified maternal and neonatal risk factors, the causes of the baby's death and the number of days spent in the neonatal unit before discharge or death.

4.3.6.1 Age on admission

Table 4.51 indicates the age of babies on admission.

Table 4.51 Age on admission (N=100)

Age on admission	Frequency	Percentage (N=100)
<6 hours	73	73%
6-24 hours	7	7%
1-7 days	6	6%
>7 days	14	14%
Total	**100**	**100%**

Table 4.51 shows that of the 100 babies admitted in the neonatal unit, 73% (n=73) were admitted before they were 6 hours old, 7% (n=7) between six and 24 hours old, 6% (n=6) one to seven days old and 14% (n=14) were more than seven days old when admitted.

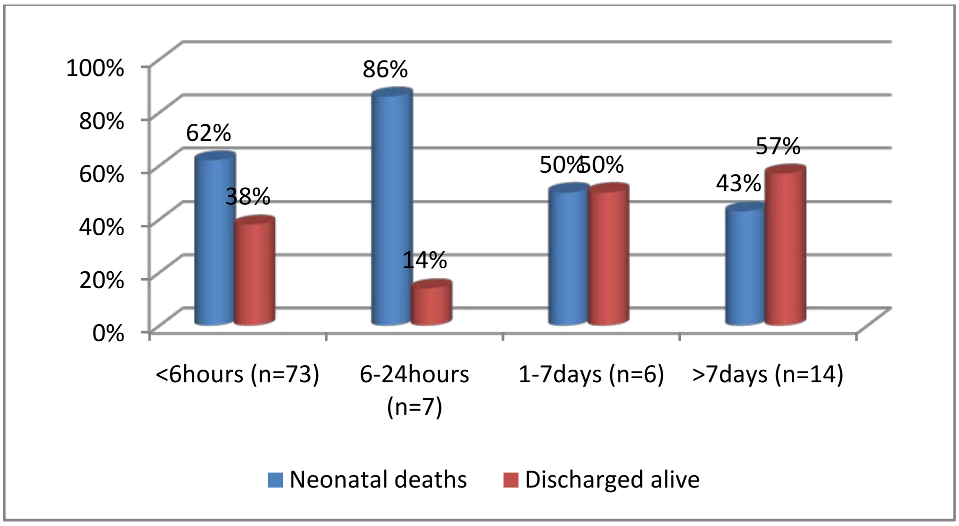

Figure 4.65

Neonatal deaths in relation to age on admission (N=100)

Figure 4.65 indicates the relationship between the neonatal deaths and the age of the baby on admission to the neonatal unit.

The incidence of neonatal death in babies who were admitted before they were six hours old (n=73) was 62% (n=45); 38% (n=28) of the babies were discharged alive.

Seven babies were admitted at between six and 24 hours old; 86% (n=6) of them died and 14% (n=1) were discharged alive.

There were six babies admitted at between one to seven days old: 50% (n=3) died and 50% (n=3) were discharged alive.

Of the 14 babies who were more than seven days old when admitted, 43% (n=6) died and 57% (n=8) were discharged alive.

The findings of the study tally with that done by with Lawn, Mongi and Cousens (2006:15), who state that the risk of the baby dying during the first day of life in Africa is close to 10 per 1000 live births. It is estimated that each year 300000 African babies die on the day of their birth due to lack of adequate maternal and neonatal care. Between 30% and 50% of newborn deaths occur on the first day of life.

4.3.6.2 Reason for admission

Figure 4.66 shows the reasons for admission of the babies to the neonatal unit.

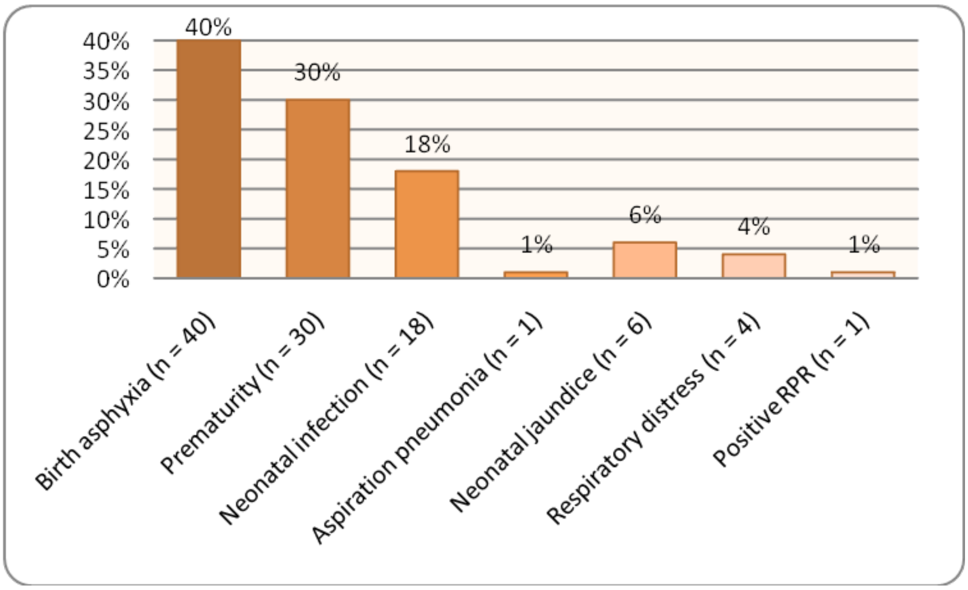

Figure 4.66

Reason for admission in the neonatal unit (N=100)

Figure 4.66 indicates that birth asphyxia accounted for 40% (n=40) of admissions to the neonatal unit, prematurity for 30% (n=30), neonatal infection for 18% (n=18), aspiration pneumonia for 1% (n=1), neonatal jaundice for 6% (n=6), respiratory distress for 4% (n=4) and positive RPR for 1% (n=1).

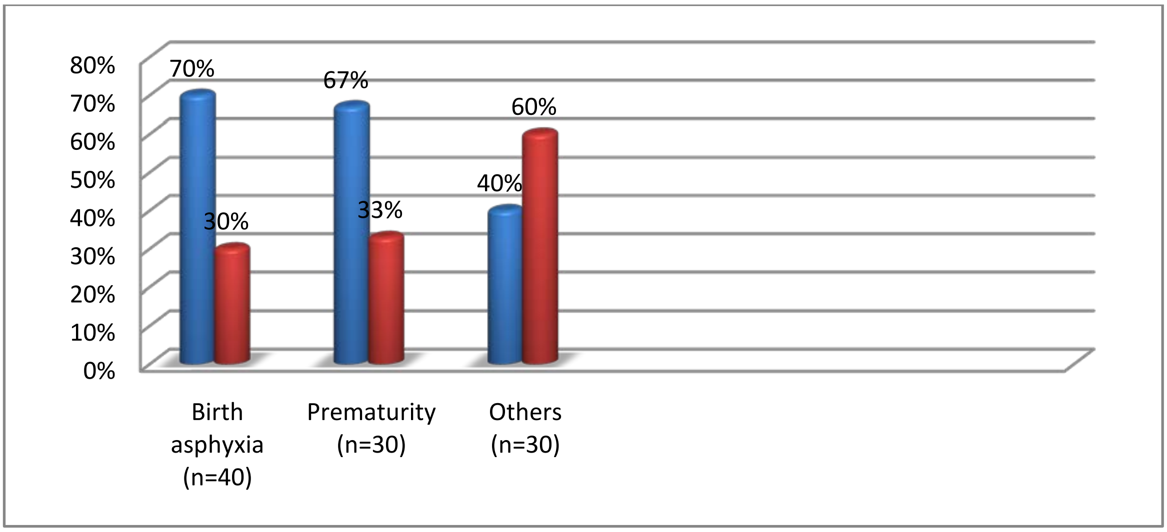

Figure 4.67

Neonatal deaths in relation to reason for admission (N=100)

Table 4.67 indicates that in babies admitted with birth asphyxia (n=40) there was a 70% (n=28) incidence of neonatal death and that 30% (n=12) of the babies were discharged alive.

Sixty-seven percent (n=20) of the babies who were admitted with prematurity (n=30) died and 33% (n=10) were discharged alive.

Babies with neonatal infection and other problems accounted for 30 babies admitted to the neonatal unit. In 60% (n=18) of cases the babies were discharged alive and 40% (n=12) died before discharge.

The results of this study are consistent with the findings in *Opportunities for Africa's Newborns* by Lawn, Mongi and Cousens (2006:16) who found that the top three causes of newborn deaths are infections, birth asphyxia and complications of preterm birth, which together account for 88% of newborn deaths in Africa.

4.3.6.3 Problems identified on admission

The baby is examined immediately for emergency signs, i.e. not breathing even when stimulated; gasping; a respiratory rate less than 20 breaths per minute, bleeding or shock characterised by pallor, coldness to the touch, a heart rate more than 180 beats per minute, an extremely lethargic or unconscious baby (WHO 2003:F–5).

Signs of respiratory distress, i.e. tachypnoea, recession, grunting, cyanosis and nasal flaring was present in 71% (n=71) of the babies; signs of respiratory distress with signs of shock presenting with bleeding, and pallor with signs of infection, were present in 1% (n=1); signs of respiratory distress and shock with hypoglycaemia in 1% (n=1) and signs of respiratory distress with convulsions in 3% (n=3). There were two babies (2%) who were admitted with respiratory distress with hypoglycaemia. There were six babies (6%) who were admitted with signs of respiratory distress and infection characterised by jaundice, hypothermia, vomiting and distended abdomen. Two babies (2%) had problems with infection, hypoglycaemia and inability to suck. Eleven babies (11%) were admitted with signs of infection only. In 3% (n=3) of the babies there was no record of the problems identified on admission.

Table 4.52 shows the problems identified on admission (N=100).

Table 4.52 Problems identified on admission (N=100)

Problems identified on admission	**Frequency**	**Percentage (n=54)**
Signs of respiratory distress (tachypnoea, recessions, grunting, cyanosis and nasal flaring)	71	71%
Signs of shock (bleeding and pallor)	1	1%
Hypoglycaemia, respiratory distress and shock	1	1%
Respiratory distress and convulsions	3	3%
Signs of infection (jaundice, hypothermia, vomiting, abdominal distention) and respiratory distress	6	6%
Respiratory distress and hypoglycaemia	2	2%
Infection, hypoglycaemia and inability to suck	2	2%
Infection only	11	11%
Not recorded	3	3%
Total	**100**	**100%**

In 66% (n=47) of the neonatal deaths, and 34% (n=24) of the babies who were discharged alive, there were signs of respiratory distress only (n=71).

The baby who manifested signs of respiratory distress with shock, infection and hypoglycaemia (n=1) died.

Fifty percent (n=1) of the babies who were admitted with respiratory distress and hypoglycaemia (n=2) died.

Sixty-seven percent (n=2) of the babies who presented with respiratory distress and convulsions (n=3) died, 33% (n=1) being discharged alive.

Likewise, 67% (n=4) of those who presented with respiratory distress and infection (n=6) died, while 33% (n=2) were discharged alive.

There were two babies who presented with signs of infection, hypoglycaemia and inability to suck. Neither of them survived (100%).

Of the eleven babies who presented with signs of infection only, 18% (n=2) died and 82% (n=9) were discharged alive.

Of the three babies where there was no record of problems on admission, 67% (n=2) died and 33% (n=1) were discharged alive.

According to Al-Saady (2007:45), the main causes of neonatal death are respiratory distress syndrome (76% neonatal death rate), sepsis (25%), birth asphyxia (76%) and congenital abnormalities (57%).

4.3.6.4 Immediate management of problems

Immediate management is provided for life-threatening emergency signs by ensuring warmth, resuscitating the baby and giving oxygen, stopping visible bleeding and giving vitamin K while taking a blood sample for typing and cross-matching, establishing an intravenous line and infusing normal saline or Ringer’s Lactate 10 ml/kg and weighing the baby (WHO 2003:F–5).

Ninety nine percent (n=99) of the babies were referred to the doctor while only in 1% (n=1) was the baby not referred.

4.3.6.5 Further assessment done to identify perinatal risk factors

After examining for emergency signs and providing immediate management, the assessment of the baby is continued. The history of the baby and the mother is obtained and the baby is examined thoroughly. The findings from the history and examination are used to choose the most appropriate management for the baby. Additional examinations are conducted and the required laboratory investigations are decided on. Appropriate laboratory investigations are performed and the baby treated. All information is recorded, including the findings of the history, examination and laboratory investigations, treatment given, changes in the baby's condition and arrangement for transfer and referral if necessary (WHO 2003:F-7).

An assessment was done on 88% (n=88) of the babies. There was no record of further assessment in the remaining 12%.

4.3.6.6 Maternal risk factors

Table 4.53 shows that maternal infections are the leading risk factors: they were present in 14% (n=13) of hypertensive disorders of pregnancy in 11% (n=10); gestational diabetes in 2% (n=2); antepartum haemorrhage in 12% (n=2); CPD in 3% (n=3); HIV positive in 14% (n=13); HIV positive and CPD in 1% (n=1); multiple pregnancies in 6% (n=6); multiple pregnancy and HIV positive in 1% (n=1); poor progress in 1% (n=1); a prolonged second stage in 1% (n=1); prolonged labour in 1% (n=1); mothers not booked in 6% (n=6); and mothers not booked and the baby born before arrival (BBA) in 2% (n=2). In 35% (n=33) of cases there was no record of maternal risk factors.

Table 4.53 shows the maternal risk factors identified on admission.

Table 4.53 Maternal risk factors (n=88)

Maternal risk factor	**Frequency**	**Percentage (n=88)**
Maternal infections	13	15%
Hypertensive disorders of pregnancy	10	11%
Gestational diabetes	2	2%
Antepartum haemorrhage	2	2%
CPD	3	4%
HIVpositive	13	15%
HIV positive , CPD	1	1%
Multiple pregnancy	6	7%
Multiple pregnancy, HIVpositive	1	1%
Poor progress	1	1%
Prolonged 2nd stage	1	1%
Prolonged labour	1	1%
Unbooked	6	7%
Unbooked , BBA	2	2%
Not recorded	26	30%
Total	**88**	**100%**

Maternal infections (n=13) accounted for 54% (n=7) of the neonatal deaths and 46% (n=6) of the babies were discharged alive.

Hypertensive disorders of pregnancy (n=10) resulted in a 50% death rate (n=5), gestational diabetes (n=2) in 50% (n=1), unbooked mothers (n=6) in 50% (n=3) and unbooked BBA (n=2) in 50% (n=1) respectively. Fifty percent of the babies in each category were discharged alive.

Antepartum haemorrhage (n=2), HIV positive and CPD (n=1) and multiple pregnancy (n=6), poor progress (n=1), prolonged second stage of labour (n=1) and prolonged labour (n=1) all resulted in a100% neonatal death rate

HIV positive (n=13) resulted in a 46% (n=6) neonatal death rate with 54% (n=7) of the babies being discharged alive.

There was a 62% (n=16) neonatal death rate and a 38% (n=10) survival rate where there was no record of maternal risk factors (n=26).

The results of this study tally with the findings in studies conducted in six developing countries where hypertensive disorders and spontaneous preterm delivery were identified as the primary obstetric causes of neonatal deaths (Ngoc et al 2006:702; Lawn, Mongi and Cousen (2006:17) state that complications during childbirth have the highest risk of stillbirth and newborn death. The results of this study are consistent with most of the studies.

Velaphi and Pattinson (2007:101) found that abruptio placentae, hypertension, infections, antepartum haemorrhage and pre-existing maternal diseases are some of the obstetric causes of neonatal deaths from asphyxia-hypoxia in South Africa, which correlates with the results of this study.

4.3.6.7 Neonatal risk factors

Table 4.54 shows that preterm babies resulted in a 29% rate of babies admitted to the neonatal unit (n=29), followed by meconium-stained liquor at 25% (n=25), then small for gestational age at 10% (n=10). Large for gestational age babies accounted for 5% (n=5), and infection for 3% (n=3). The other risk factors accounted for only 1% (n=1) to 2% (n=2) admissions.

Table 4.54 shows the neonatal risk factors of babies who were admitted to the neonatal unit.

Table 4.54 Neonatal risk factors (N=100)

Neonatal risk factor	Frequency	Percentage (N=100)
Meconium stained liquor	25	25%
Small for gestational age	10	10%
Small for gestational age and breech presentation	1	1%
Preterm	29	29%
Preterm and transverse lie	1	1%
Large for gestational age	5	5%
Postterm	1	1%
Bronchopneumonia	2	2%
Breech presentation	1	1%
Congenital abnormalities	2	2%
Cord prolapse	2	2%
Herbal intoxication	2	2%
HIV +	1	1%
Hypoxia	1	1%
Infection	3	3%
Multiple pregnancy	1	1%
Transverse lie	1	1%
Not recorded	12	12%
Total	**100**	**100%**

Meconium-stained liquor (n=25) resulted in a 68% death rate (n=17), 32% (n=8) of the babies being discharged alive.

Small for gestational age babies (n=10) had a 30% (n=3) neonatal death rate, while 70% (n=7) babies were discharged alive.

Seventy-two percent (n=21) of preterm babies (n=29) died and only 28% (n=8) of the babies were discharged alive.

Infection (n=3) resulted in a 67% (n=2) neonatal death rate and only 33% (n=1) of the babies were discharged alive.

Of the twelve babies where there was no record of neonatal risk factors, 67% (n=8) died and 33% (n=4) were discharged alive.

Babies in whom the risk factors of bronchopneumonia (n=2), breech (n=1), congenital abnormalities (n=2), cord prolapse (n=2), herbal intoxication (n=2), hypoxia (n=1) and transverse lie (n=1) were present, all died.

The small for gestational age baby with breech presentation (n=1), preterm baby with transverse lie (n=1), HIV positive exposed baby (n=1) and one baby from a multiple pregnancy (n=1) were discharged alive.

Figure 4.68 indicates the relationship between the neonatal deaths and the neonatal risk factors identified on admission.

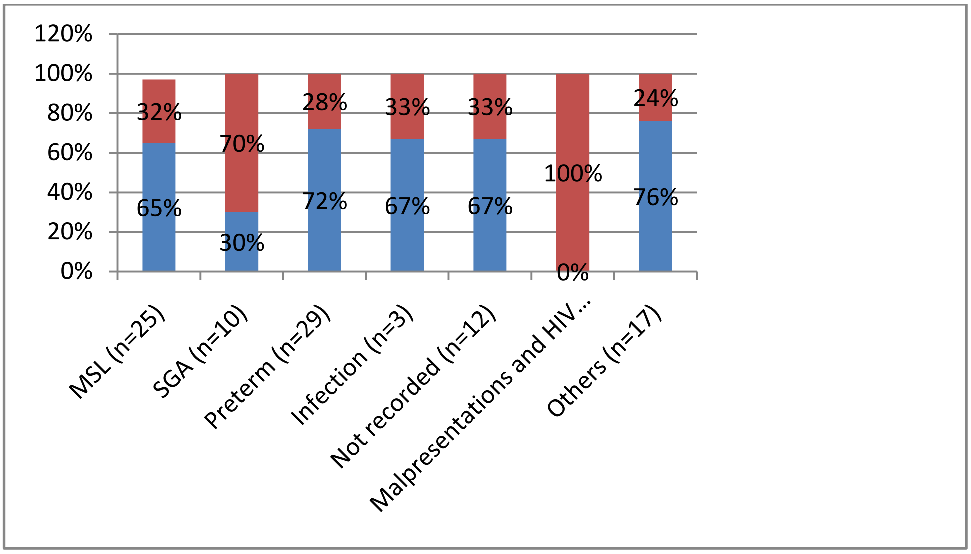

Figure 4.68

Neonatal death in relation to neonatal risk factors (N=100)

The findings of this study are consistent with those of the study conducted in six developing countries where it was found that the main causes of early neonatal deaths were prematurity, asphyxia and congenital anomalies (Ngoc et al 2006:702).

4.3.6.8 The estimated gestational age

Preterm babies accounted for 37% (n=37) of the babies admitted to the neonatal unit, while term babies accounted for 49% (n=49) and post-term babies for 2% (n=2). In 12% (n=12) of cases there was no record of the gestational age.

Figure 4.69 shows the neonatal deaths in relation to the gestational age of babies who were admitted to the neonatal unit.

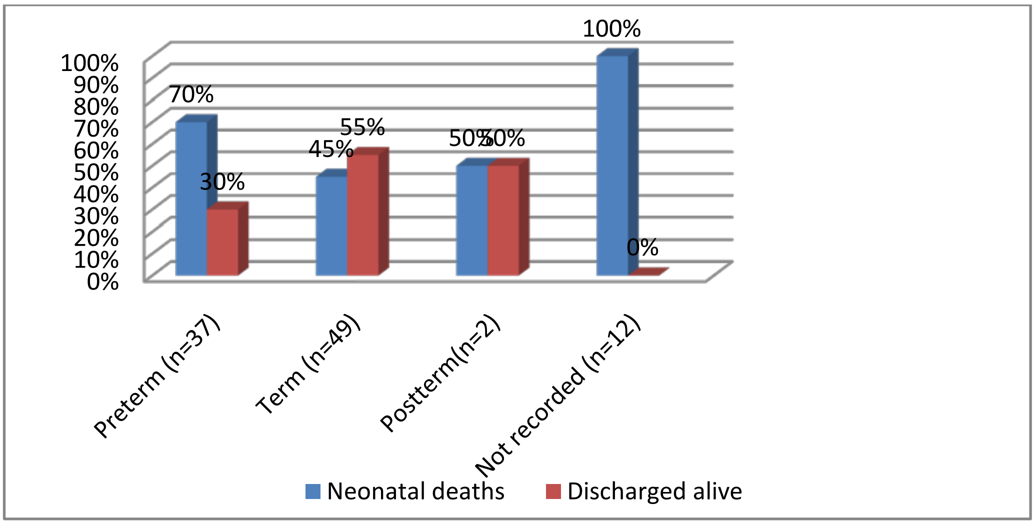

Figure 4.69

Neonatal deaths in relation to gestational age (N=100)

Seventy percent (n=26) of the preterm babies admitted (n=37) died, while 30% (n=11) of preterm babies were discharged alive.

Forty-five percent (n=22) of term babies (n=49) and 100% (n=12) of babies where there was no record of any estimate of gestational age, died, while 55% (n=27) of the term babies were discharged alive.

Post-term babies (n=2) had a 50% death rate (n=1) and 50% (n=1) of the babies were discharged alive.

The findings of this study are consistent with the results of the study done by Mohsin et al (2006:643) in New South Wales, Australia, who found that very low birth weight (less than 2000 g) contributed to 75.6% of the risk of stillbirths and 59.4% of the neonatal deaths. Low gestational age (less than 32 weeks) accounted for 77.7% of stillbirths and 87.9% of neonatal deaths.

4.3.6.9 Classification of infant according to weight for gestational age

Table 4.55 indicates the weight for gestational age of babies admitted to the neonatal unit.

Table 4.55 Weight for gestational age ((N=100)

Weight for gestational age	Frequency	Percentage (N=100)
Small for gestational age	44	44%
Average for gestational age	4	4%
Large for gestational age	7	7%
Not recorded	45	45%
Total	**100**	**100%**

Table 4.55 shows that 44% (n=44) of the babies were small for gestational age, 4% (n=4) were average for gestational age and 7% (n=7) were large for gestational age. In 45% (n=45) of the babies, there was no record of the weight for gestational age.

Figure 4.70 shows the neonatal deaths in relation to the weight for gestational age.

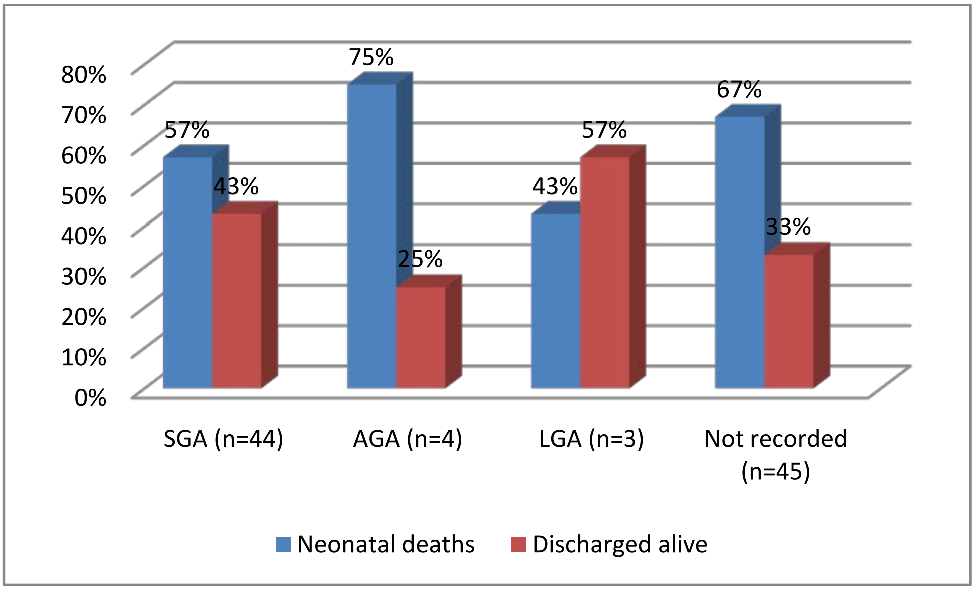

Figure 4.70

Neonatal deaths in relation to weight for gestational age (N=100)

The small for gestational age babies (n=44) accounted for 57% (n=25) of the neonatal deaths, 43% (n=19) of the babies being discharged alive.

The average for gestational age (AGA) babies (n=4) accounted for 75% (n=3) of the neonatal deaths, 25% (n=1) of the babies being discharged alive.

In the large for gestational age babies (LGA) (n=7), the neonatal death rate was 43% (n=3,) 57% (n=4) babies being discharged alive.

These findings contrast with the findings in the study conducted by Vashevnik et al (2007:305), who found increased mortality in the large for gestational age foetus beyond term. They also found that small for gestational age foetuses are at much higher risk than those of normal size across all gestational ages.

4.3.6.10 The primary causes of the baby's death

Sixty babies died in the neonatal unit. The primary causes of the babies' death are analysed in figure 4.71.

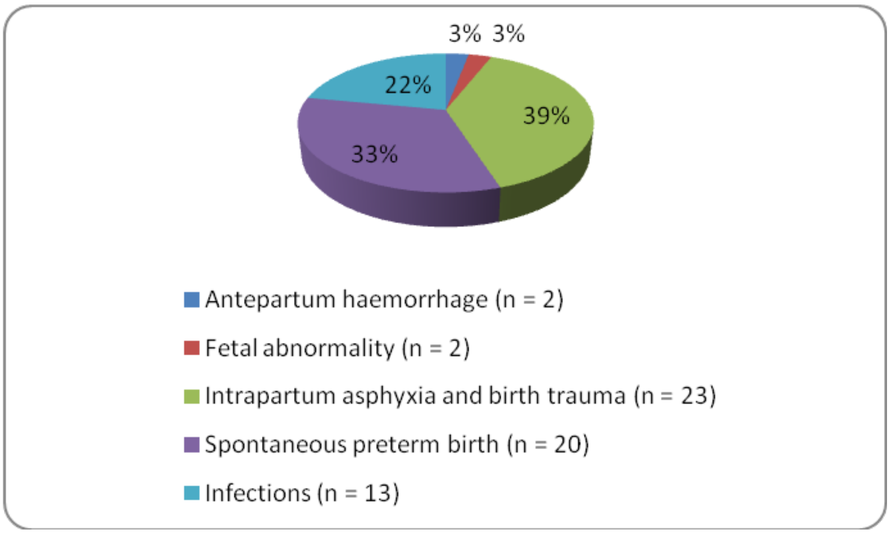

Figure 4.71

The primary cause of the babies' death (n=60)

Figure 4.71 shows that 39% (n=23) of babies died due to intrapartum asphyxia and birth trauma, while 33% (n=20) of the babies' deaths was due to spontaneous preterm birth. Infection accounted for 22% (n=13) of the neonatal deaths, while antepartum haemorrhage accounted for 3% (n=2) and foetal abnormalities for 3% (n=2).

These results are consistent with the study on avoidable factors and causes of neonatal deaths in South Africa where asphyxia-hypoxia accounted for 32% and immaturity for (35.2%). Asphyxia-hypoxia was identified as the most common cause of intrapartum asphyxia and it accounted for more than 60% of all the neonatal deaths from asphyxia-hypoxia in all the different groups of hospitals, with the rural hospital reaching 81% (Velaph & Pattinson (2007:101). This is supported by the results from the Perinatal Problem Identification Programme (PPIP) which indicated that intrapartum asphyxia and birth trauma remain the cause of death in babies weighing ≥2500 g, which is associated with prolonged or obstructed labour (Pattinson 2003–2005:1) and by Al-Saady (2007:45), who cites the main causes of neonatal deaths as respiratory distress syndrome (which is more common in premature neonates (97.76%) than in term neonates (1.90%), sepsis, birth asphyxia and congenital abnormalities.

4.3.6.11 Number of days in neonatal unit until discharge or death

Sixty-eight percent (n=68) of the babies spent less than seven days in the unit before discharge or death while 32% (n=32) spent more than seven days but less than a month before discharge or death.

Table 4.56 indicates the number of days the babies stayed in the neonatal unit until discharge or death.

Table 4.56 Number of days babies stayed in neonatal unit (N=100)

Number of days in neonatal unit	Frequency	Percentage (N=100)
<7days	68	68%
≤one month	32	32%
Total	**100**	**100%**

Of the 60 babies that died, 78% (n=47) died within seven days while only 22% (n=13) died within a month of admission to the neonatal unit.

Of the neonatal deaths that occurred within seven days (n=47), intrapartum asphyxia and birth trauma accounted for 43% (n=20), followed by spontaneous preterm birth at

36% (n=17), infections at 13% (n=6) and foetal abnormality and antepartum haemorrhage at 4% (n=2) each.

Figure 4.72 indicates the causes of neonatal deaths within seven days after delivery.

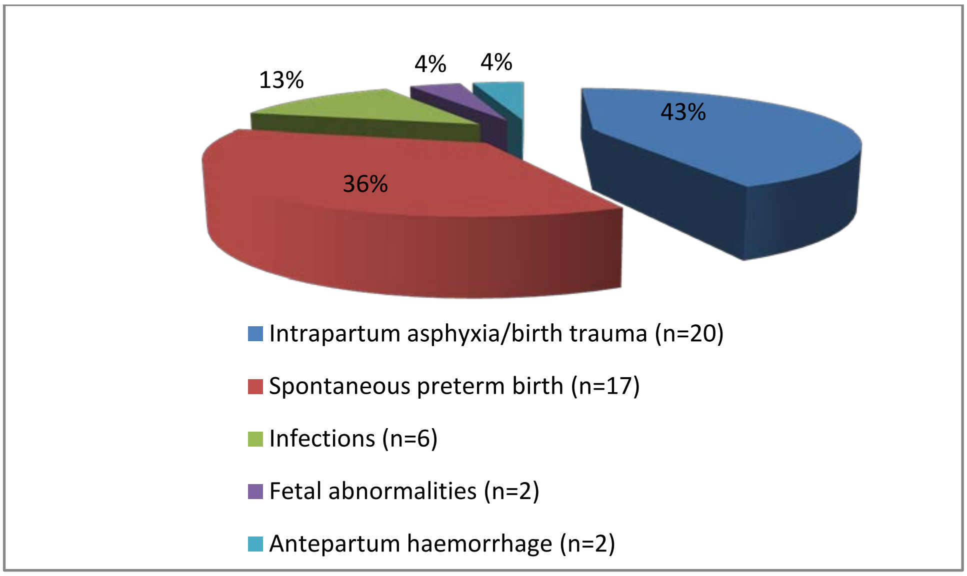

Figure 4.72

Causes of neonatal deaths within seven days n=47)

The Partogram was used in only 44% (10) of the cases of babies who died from interpartum asphyxia (n=23), was used infrequently in 26% (n=6) of cases and not at all in 30% (n=7) cases. Resuscitation was attempted in 96% (n=22) of cases and not attempted in only 4% (n=1) of cases.

The results of this study are consistent with the study done by Lawn Wilczynska-Ketende and Cousens (2006:711), in their global study on the causes of neonatal deaths. They found that preterm, birth asphyxia and infections are the major causes of one-quarter to one-third of all neonatal deaths. This is confirmed by Sachdev (2006:718) in the commentary on the global estimates that birth asphyxia accounts for (23%) of neonatal deaths, infections for 35% and complications of prematurity for 28%

Infections 54% (n=7) accounted for most of the neonatal deaths within a month (n=13), followed by intrapartum asphyxia and birth trauma (23% (n=3)) and spontaneous preterm birth (23% (n=3). The results are consistent with the study done by Baqui et al (2006:706), who found that preterm births (28%), sepsis or pneumonia (26%) and birth asphyxia (23%) were the main causes of neonatal deaths in India. They stated further that the WHO attributed (30%) of neonatal deaths in the South Asian regions to preterm births, (27%) to sepsis or pneumonia, (23%) to birth asphyxia, (6%) to congenital abnormalities, (4%) to tetanus, (3%) to diarrhoea and (7%) to other causes. In this study, they found that the overall common causes of neonatal deaths were preterm births (27%), sepsis or pneumonia (24%), and birth asphyxia or injury (31%). Preterm birth (26%) was the most common cause of death on day zero. On day one and during the first week of life, the proportion of deaths caused by birth asphyxia or injury was lower than on day zero (14%). On days one to six the most common causes of death were preterm birth at (30%) and sepsis or pneumonia (25%). The proportion of deaths caused by sepsis or pneumonia increased to (45%) from days seven to 13 and (36%) from day 14 to 27.

According to Lawn, Mongi and Cousens (2006:16), babies in Africa are at high risk of being born preterm (12%) which is double the frequency of preterm birth in European countries and may be related to infections, especially sexually transmitted infections and HIV/AIDS. They further stated that in sub-Saharan Africa, 14% of babies are born with low birth weight due to poor growth in utero, being born too early or both.

Of the 40 babies who were discharged alive, 53% (n=21) were discharged within seven days and 47% (n=19) were discharged within a month of admission to the neonatal unit.

In Africa, most maternal and newborn deaths occur during childbirth and in the first few days of life according to De Graft-Johnson, Kerber, Tinker, Otchere, Narayanan, Shoo, Oluwole and Lawn (2006:24) in Opportunities for Africa's Newborns.

Warren, Daly, Toure and Mongi (2006:80) state that sub-Saharan Africa has the highest rates of neonatal mortality in the world and has shown the slowest progress in reducing newborn deaths, especially deaths in the first week of life. They further state that asphyxia claims many lives during the first day and preterm during the first week. Thirty-eight percent of babies in sub-Saharan Africa die of infections after the first week of life mainly in LBW babies and preterm babies.

In 2009, from January to December, the level 1 hospital under study had a neonatal mortality rate of 21/1000 which is comparable to the national neonatal mortality of 21/1000 in South Africa in 2005 (Pattinson 2003-2005:3).

4.4 CONCLUSION

This chapter discussed the data analysis and findings and presented them in table and graphic format. Literature was used where applicable to indicate similar or different findings.

Chapter 5 concludes the study, discusses the limitations, and makes recommendations for practice and further research.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapters described the research study and discussed the literature search and the conduct of the study.

The researcher used the research instrument to collect vital data, which was processed with the assistance of a professional statistician.

This chapter summarises the research and makes recommendations for future research. The limitations of the study are also discussed.

5.2 SUMMARY

5.2.1 The research process

The WHO has developed standards for maternal and neonatal care which should be considered when caring for pregnant mothers and their babies.

According to the literature review, the leading causes of neonatal deaths are infection, preterm births and birth asphyxia. It was also indicated that most of the deaths from these causes are preventable through better obstetric care and rapid response to intrapartum complications, including reducing delays in recognition of complications at home and transportation to hospital.

Studies done show evidence-based practice that supplementation with folic acid and calcium and immunisation with tetanus toxoid reduce neonatal deaths and prevent some congenital abnormalities, such as neural tube defects. The literature also indicated that management during labour of premature rupture of membranes, preterm labour and breech presentation, and the use of the Partogram and clean deliveries can reduce neonatal deaths. Resuscitation of newborn babies, breastfeeding, prevention of hypothermia and Kangaroo Mother Care decrease neonatal mortality during the postnatal care.

The overall aim of the study was to propose strategies to reduce the high neonatal mortality rate at a selected hospital in the Mpumalanga province, which includes patients admitted from its maternity unit and its feeder clinics. The purpose of the study was to explore the factors contributing to neonatal deaths at the hospital under study so as to reduce the neonatal mortality rate. The research objectives that guided the study were to determine underlying contributory factors to neonatal deaths in an obstetric unit and propose strategies for midwifery practice in order to prevent neonatal deaths.

The assumption for the study was that there were factors related to antenatal care, labour and delivery care, postnatal and nursery care that contributed to neonatal deaths. The study would be of significance to health care practitioners regarding the contributory factors which caused neonatal deaths and it would impact on the training implications for personnel working in a maternity unit, resulting in improved maternal and neonatal care and facilities.

The design used for the study was a quantitative, non-experimental, descriptive, exploratory and retrospective (ex-post facto) design, in order to explore and describe the factors contributing to neonatal deaths.

The population for the study comprised all live births in the district hospital under study from January to December 2009. The target population for this study was all newborn babies admitted to the neonatal care unit during January and December 2009.

For this study, the sample comprised all newborn babies who were admitted in the neonatal unit from January to December 2009 with a gestational age of 28 weeks or more and weighing 1000 g or more, and who died within a month or were discharged home alive within a month of delivery.

The sampling for the statistics of neonatal deaths was done through the census, and probability sampling (using the systematic sampling technique) was used for the babies who were discharged alive. The records were chosen according to the eligibility criteria discussed below.

The researcher used all records of neonatal deaths of babies that were delivered alive in the hospital or on the way to the level I hospital under study from January to December 2009, with a gestational age of 28 weeks and above, weighing 1000 g and above and who died within one month of delivery.

A control group included neonates who were delivered in the level 1 hospital under study alive or on the way to the hospital and were admitted to the neonatal care unit with a gestational age of 28 weeks and above, weighing 1000 g and above, and were discharged home alive within one month of delivery from January to December 2009. Babies born from mothers either attending or not attending the antenatal clinic were also included in the study.

The sample size comprised 60 records of neonatal deaths and 40 records of babies who were discharged alive, which constituted a sample size of one hundred records.

Neonatal deaths occurring at home or on the way to hospital or clinic were not included in this study. Babies, who died weighing below 1000 g, even if born alive, were not included in this study. Babies dying after one month of delivery were excluded from the study.

The researcher in this study used all the elements of the population because the population of 100 or less is small and a sample could not be drawn from it. The rationale behind using total population was the representativeness of the sample.

Data were collected by making use of an audit which was conducted retrospectively from delivery registers, the neonatal admission register, and maternal and neonatal records of babies who died in the labour unit and neonatal unit within 28 days of life from January-December 2009. In order to prevent bias, the researcher selected documents which met the inclusion criteria.

The validity of the audit tool was evaluated for external, internal, content and face validity by colleagues who are experts in the field of obstetrics and neonatal care, such as advanced midwives, experienced midwives and the head of the obstetric unit. The reliability of the audit tool was assessed by doing a pre-test before it was used for the study to ensure that it was stable and consistent.

Data were collected in the record section, where all files of patients were kept.. Records were not removed from the record section, to maintain confidentiality. Permission was granted to access the records for the purpose of this research by the clerk supervisor.

The ethical principles: the principle of beneficence, the principle of respect for human dignity and the principle of justice were adhered to in the study to safeguard the confidentiality of the records, which were anonymous.

5.2.2 Findings

The study contributed to the identification of contributory factors to neonatal deaths. An audit tool was used to collect data from the records and it included six sections.

The guidelines of the DoH (Department of Health) towards antenatal care, intrapartum care and immediate care of newborn baby were used.

Antenatal care attempts to ensure by antenatal preparation the best possible pregnancy outcome for women and their babies by screening for pregnancy problems, assessing pregnancy risks, treating problems that may arise during the antenatal period, giving medications that may improve pregnancy outcome, providing information to pregnant women and by physical and psychological preparation for childbirth and parenthood.

5.2.2.1 Section A – The first antenatal visit

The section comprised items on the assessment of the mother on the first antenatal visit. The first antenatal visit is the most crucial visit, where baseline data and all relevant history are taken and investigations are conducted.

- **Age distribution**

It was found that the younger the mothers the higher the risk of neonatal deaths; mothers of under 15 years experienced 100% neonatal deaths, while those above 35 years experienced 36% of the reported neonatal deaths. In the case of those between 16 years and 35 years the neonatal deaths ranged between 53% and 67% respectively.

- **Antenatal booking status**

The antenatal care of the mothers seems not to have had an effect on the neonatal survival rate, as there were a high number of neonatal deaths (63%) in the booked mothers as compared with the unbooked mothers (56%).

- **Parity and gravidity**

According to the findings, low parity and gravidity seemed to impact on the neonatal death rate of 66% and 59% respectively, with a 50% for both para 3–4 and above 5.

- **Previous obstetric history**

Most of the mothers had not had any previous abortions (87%), stillbirths or neonatal deaths (84%). The majority of the mothers (53%) had previously delivered at 37–40 weeks of gestation, and in most records the gestational age was not indicated (46%). The records showed that most mothers had delivered their babies at the hospital (54%) while in almost half of the records it was not indicated where the mothers had delivered previously. According to the records, most of the babies were delivered at an average weight of 2500 g–4000 g (51%), while in 46% of the records the estimation of weight was not recorded. Most mothers had not experienced any complications during their previous pregnancies (39%), and in 49% of the cases there were no records of complications.

- **Medical history**

The medical history of the mothers seemed not to have any impact on the neonatal deaths, as there were 67% of neonatal deaths in the mothers with no medical history. The records showed that most of the mothers were not smoking or taking alcohol or any type of drug during pregnancy (79%), though in 21% of the cases there was no recording of the lifestyle habits. Most of the mothers had not had surgery (75%) and for only 3% of the mothers were obstetric surgery reported and gynaecological surgery was reported in 1%. In 21% of cases there was no record of any surgical history.

- **Family history of mothers**

The great majority of mothers did not have any family medical or obstetric history that could predispose the mothers to complications (62%). Hypertension seemed to be the most common family history in mothers (14%) followed by diabetes at 3%, while in 17% of the cases there was no record of any family history.

- **Gestational age at first booking**

The neonatal deaths occurred mostly in mothers who had booked between 17 and 24 weeks of gestation (69%), and above 28 weeks of gestation (64%).

- **Foetal movements**

It is alarming to find that foetal movements were not recorded in the majority of mothers during the antenatal care (90%), 59% of whom experienced neonatal deaths.

- **Physical examination**

Height

The height of the mothers was only recorded in 46% of the mothers and they were all above 150 cm, while in 54% of the mothers there was no recording of the height.

Weight

The study found that the majority of the mothers weighed between 51 and 70kg (73%) and these had 61% of the neonatal deaths. Only 22% of the mothers weighed above 71kg, 65% of whom reported neonatal deaths, while one weighed below 50kg (1%). In 4% of the cases weight was not recorded.

Blood pressure

The findings showed that 72% of the mothers had normal blood pressure; however, 66% of these mothers experienced neonatal death. The mothers with slightly elevated blood pressure (24%) had 58% of neonatal deaths. The 4% of the mothers who had blood pressure above 140/90 reported 33% of neonatal deaths.

Urine analysis

The majority of the mothers had normal urine (64%), while a few cases had abnormalities in the urine. There was protein in 6%, glucose in 1%, leucocytes 3% and ketones also in 1%.

Condition of teeth

Very few mothers had dental caries (4%), while the majority had normal teeth (83%). In 13% the condition of teeth was not recorded.

Pallor

The findings showed that the majority of the mothers (89%) had no pallor, while there was no record in 11% of the total sample.

Condition of the thyroid

The findings showed that the thyroid was normal in 86% and there was no record of the condition of the thyroid in 14% of the mothers.

Condition of the breasts

The breasts were examined in 85% of the mothers and found to be normal, while in 10% there was no record of the condition of the breasts.

Presence of oedema

Only in 4% of cases was oedema recorded and it was found mainly on the legs. The majority, namely 85% of the mothers, did not present with oedema.

Examination of the abdomen

In 89% of the mothers, the abdomen was recorded to be normal; however, there was no record of the examination of the abdomen in 11%.

Examination of the lungs

Examination of the lungs was done in 78% of the mothers and there was no record in 22% of the mothers.

Respiratory and pulse rate

Most of the mothers had a normal respiratory and pulse rate (59% and 64% respectively) while there were no records of respiratory and pulse rate in 41% and 36% respectively of the mothers.

Symphysis fundal height

In the majority of the mothers the symphysis fundal height was between the 10^{th} and 90^{th} percentile (83%), and they had 62% neonatal deaths. Only one (1%) had a symphysis fundal height of above the 90^{th} percentile, and the baby died, while 8% had a symphysis fundal height of below the 10^{th} percentile, with 50% neonatal deaths, and in 6% there was no record of the symphysis fundal height.

Sonar done for baseline information

The findings showed that for 8% of the mothers sonar was conducted; however, for 92% no sonar examination was done.

Investigations

A high neonatal death rate was reported in mothers who had no results of RPR (81%), Rhesus factor (82%), haemoglobin (80%), HIV (88%) and in mothers whose haemoglobin level was 12 g/dl–18 g/dl (73%). The neonatal deaths were also high in mothers who were on dual therapy (75%).

- **Supplementation and immunisation**

There was a good coverage of the supplementation and immunisation during the antenatal visits, namely 99% and 92% respectively.

- **Risk grading**

Few mothers were graded as high risk or medium risk (14% and 8% respectively). Half of the mothers were graded as low risk (50%) while there was no record of risk grading in 28%.

- **Information on antenatal follow ups and delivery plan**

The records showed that most of the mothers had to attend antenatal follow-ups at the local clinic (76%), but there was no record in 23% of cases of the antenatal follow ups. Few mothers were to deliver at the clinic (14%), and most of them had to deliver at the district hospital (55%), while there was no record in 31% of the cases.

5.2.2.2 Section B – The subsequent antenatal visits

The section comprised items on the assessment of the mother on the subsequent antenatal visits. The management of subsequent visits is almost the same as the first antenatal visit, with some differences. A summary of basic antenatal care is checked, the woman is asked about her general well-being, foetal movements, danger symptoms and any other problems.

- **Number of antenatal visits**

There was a high percentage of the mothers who attended subsequent visits (86%). According to the findings, the subsequent antenatal visits did not have any significance as regards the neonatal deaths, irrespective of the number of the visits.

- **Foetal movements**

The majority of the mothers had normal foetal movements (99%).

- **Blood pressure**

There was a difference in blood pressure recordings during the first antenatal visits and the subsequent visits. The majority of the mothers had a normal blood pressure (73%).

Recording during the subsequent antenatal visits seemed to be a problem. Some assessment were not done or recorded in most of the mothers, for example pallor (97% records lacking), pelvic assessment (95%), haemoglobin at 32 weeks (98%), and at 38 weeks (100%), information for danger signs (43%), delivery plan (48%).

5.2.2.3 Section C – Admission in labour

This section comprised items on the assessment of the mother on admission during labour. On admission, a full general, abdominal and vaginal examination must be performed and risk factors identified. This assessment provides the baseline data against which future observations and assessments can be made as labour progresses.

- **Antenatal risk factors**

The antenatal risk factors were found to be assessed in the majority of the mothers (89%) and not assessed in 4% of the mothers, while there was no record in 7% of the cases.

- **Antenatal history taken if woman unbooked**

The antenatal history was not recorded in 85% of the unbooked mothers. In 15% of the cases the antenatal history was taken.

- **HIV status recorded on admission**

Most of the mothers were HIV negative on admission (55%) and there was no recording in 26% of the cases. Only 15% of the mothers were HIV positive and 4% refused testing during the antenatal care. Voluntary Counselling and Testing (VCT) was done on 12% of the mothers who did not have HIV results on admission.

- **Condition of liquor and duration of rupture of membranes**

Most of the mothers were admitted with intact membranes (68%). Clear liquor was recorded in 12% of the cases, while meconium-stained liquor was only recorded in 3% of the cases, and only 1% of the cases was recorded to have offensive liquor. In 16% there was no record of the condition of membranes.

In 15% of the mothers there was no record of the duration of rupture of membranes. Five percent had ruptured membranes less than 4 hours and another 5% ruptured membranes for more than 24 hours, while 8% of the mothers had ruptured membranes between 5 and 24 hours.

- **Vital signs**

The majority of the mothers had a normal temperature (86%) and in 9% of the mothers there was no record of the temperature. Blood pressure was found to be normal in 57% of the mothers.

- **Oedema**

The majority of the mothers (80%) did not have oedema, while 14% of them were admitted with oedema of the legs only, 2% with oedema of the legs and face only. Those admitted with oedema of the legs and hands were the same number as those admitted with oedema of the legs, face and hands, and they accounted for a very small percentage, of 1% each. There were a few mothers (2%) who did not have any record of whether they were admitted with oedema or not.

- **Pallor**

There was a high percentage of mothers (68%) who did not present with pallor on admission, while only a small percentage (1%) presented with pallor. In 31% of the mothers there was no record of whether they had pallor or not on admission.

- **Abdominal examination**

The majority of the mothers did not have a symphysis fundal height measurement assessment (73%); palpation was done in 94% of the mothers. In most of the mothers the lie was longitudinal (88%), with cephalic presentation. Only two of the mothers had a transverse lie and one a breech presentation. The findings indicated that the majority of the foetal positions were anterior (73%), and recordings were not done on the other mothers (27%). It was also indicated that the attitude of the foetus was well flexed (60%), but not recorded in 40%. The level of the presenting part was found to be at 4/5 in most of the mothers (57%), with adequate liquor in 51%.

There was no record of liquor in most of the mothers (44%), and there was high neonatal death in these mothers (79%). The study found that there was no recording of the uterine tone (81%). The contractions ranged from mild (33%) to moderate (21%) and strong contractions (29%) and in 8% of the mothers there was no record of the contractions on admission.

The foetal heart rate was normal for the majority of the mothers (75%), with 7% of the mothers reporting foetal tachycardia, foetal bradycardia in 3% of the mothers, and no record in 15%. There was a high neonatal death rate both in the mothers with normal foetal heart rates (61%) and the mothers who had no record of the foetal heart rates (77%).

According to this study, foetal weight was estimated in most of the mothers (61%) but not in 39%; 43% of the babies were estimated to weigh between 2500 g and 4000 g.

- **Vaginal examination**

Vaginal examination was found to have been done in the majority of the mothers (91%), with sores/warts found in 1% of the mothers. Most the mothers were admitted in the latent phase of labour (53%) and fewer mothers were admitted in the active and second stage of labour (24% and 22% respectively). Of the mothers who were admitted in the latent phase of labour, it was found that 63% reported neonatal deaths, the same as those admitted in the active phase of labour, while the mothers who were admitted in the second stage of labour had a lower percentage of neonatal deaths (59%).

Most of the mothers were found to have intact membranes on admission (67%) while 24% of the mothers were admitted with spontaneous rupture of membranes, 8% had meconium-stained liquor and 4% had offensive liquor; in half of the mothers there was no record of the condition of the liquor (50%). The findings of the study showed that most of the mothers who had clear liquor had 60% of reported neonatal deaths, while all the babies from mothers who had meconium-stained liquor died. Where there were no records of the condition of liquor, 85% of neonatal deaths were reported, and 91% where there was no record of the duration of rupture of membranes.

In the study, it was found that most of the foetuses presented with the vertex (77%) and only one with breech and one with compound presentation. The recording of the presenting part was not assessed in 21% of the mothers. Moulding was absent in 80% of the foetuses and there was no record in 14% of the mothers. Parieto-parietal moulding was reported in 4% of the cases. Caput was not found in 81% of the mothers and the descent of the foetal head was found in 73% of the mothers. Pelvic assessment was done on 62% of the mothers and there was no record in more than a third of the mothers (38%). The majority of the mothers assessed had an adequate pelvis (84%).

- **Result of investigations**

The findings showed that urinalysis was done in 75% of the mothers, while there were no blood results in the majority of the mothers who were unbooked (84%); a few mothers had blood investigations done: i.e. haemoglobin (12%), blood grouping (2%) and VDRL (2%).

5.2.2.4 Section D – Intrapartum care

This section comprised items on the assessment of the mother during the intrapartum care, making use of the Partogram. The Partogram, as described in chapter 2, is a measure for evaluating the progress of labour graphically. All observations, fluid intake and output, and medications are entered on the Partogram to assess the progress of labour and condition of mother and foetus.

- **Partogram use**

The study found that the Partogram was used in just over half of the mothers to monitor labour (54%), with 62% of neonatal deaths reported; 60% of neonatal deaths were reported where the Partogram was not used.

- **Latent phase of labour monitoring**

The latent phase of labour was not monitored in all the mothers where the Partogram was used, which is alarming, since problems may be identified earlier when the latent phase of labour is monitored. Most of these mothers had neonatal deaths (64%).

- **Active phase of labour monitoring**

The active phase of labour was found to be monitored frequently in 83%, while infrequently monitored in 17% of the cases. Just over half of the mothers where the labour was monitored frequently reported neonatal deaths (54%), while in the mothers who were infrequently monitored there were 75% of neonatal deaths reported.

Maternal and foetal condition

In the study, it was found that the maternal and foetal condition was monitored frequently in the majority of the cases (83%), which indicates that problems could be identified early and managed. There was no monitoring in 17% of the mothers and there was a high percentage of neonatal deaths in these mothers (88%), while more than half of the mothers who were monitored frequently had a lower rate of neonatal deaths (56%).

The majority of the foetal hearts were normal (87%), though the cardiotocograph was only used in more than half of the mothers (51%). With these mothers there was a high percentage of neonatal deaths (67%) and fewer neonatal deaths with the mothers where the cardiotocograph was not used (57%).

The mothers who had clear liquor experienced a high neonatal mortality (86%) and those who had meconium-stained liquor had 69% of neonatal deaths.

Progress of labour

The progress of labour was found to have been monitored regularly in 85% of mothers, and only infrequently in few mothers (15%). The study found that where the progress of labour was monitored frequently, more than half of the mothers had neonatal deaths (58%), and where the progress of labour was infrequently monitored, more babies died (86%).

Treatment given during labour

More than half of the mothers were given treatment (59%) such as antibiotics, oxytocin and intravenous infusion.

Problems identified during labour

It was found that in most of the mothers the problems were not recorded (29%), followed by other problems (25%); poor progress accounted for 32% of these problems. Foetal distress was highest in the identified problems at 19%, followed by cephalopelvic disproportion (15%).

Proposed management

Most of the mothers with problems were referred to the doctor (63%), but more than a third of them were not referred (35%). There was not much difference in the percentage of neonatal deaths for mothers who were referred (59%) and those who were not referred (56%).

5.2.2.5 Section E – Management of the second stage of labour

This section comprised items on the management of the mother during the second stage of labour. During the second stage of labour the observations of the first stage of labour should continue. Bearing down should only be encouraged when the foetal head starts to distend the perineum and the mother has an urge to push (see section 2.2.2.2.3).

- **Method of delivery**

The majority of the mothers delivered normally (77%) and these had a slightly lower percentage of neonatal deaths (63%) than those mothers who delivered by caesarean section (23%), who had 67% of neonatal deaths.

- **Apgar scoring assessment at one minute and five minutes and resuscitation measures taken**

Most of the mothers whose babies had a low Apgar reading had a complicated delivery (96%) and the babies who were born with an Apgar of below 3/10 (12%) all died; those with an Apgar of between 3/10 and 6/10 (45%) had a 60% neonatal death rate, while those with an Apgar of above 7/10 had a 55% death rate.

Most of these babies needed resuscitation (61%), and these babies had a high neonatal death rate (65%), while those that did not need resuscitation still accounted for more than half of neonatal deaths (58%). The study found that in babies where resuscitation took less than five minutes the survival rate was higher (75%), whereas when the duration of resuscitation was not recorded the death rate was high (71%).

- **Prophylactic drugs given**

Prophylactic treatment was given to most of the babies (84%): Nevirapine (39%) and AZT (15%). The babies from HIV positive mothers had a neonatal death rate of 31%. Where there was no recording of prophylactic treatment, both in HIV exposed babies and HIV negative babies (9%), they all died.

- **Congenital abnormalities**

The two babies who had congenital abnormalities both died.

- **Birth weights**

The findings showed that babies weighing less than 1500 g had a high risk of dying (80%), followed by those weighing between 2000 g and 2499 g (71%). Surprisingly, babies weighing between 1500 g and 1999 g had a lower neonatal death rate (64%), as did those above 2500 g (57%).

- **Duration of labour**

It seems the duration of labour impacted on the neonatal deaths. The mothers who had a shorter labour of 5 to 10 hours only had 47% of neonatal deaths, followed by the mothers who had 11–18 hours of labour (78%) while those who had more than 18 hours of labour had a high neonatal death rate (100%). The death rate was also high in mothers where there was no record of the duration of labour (70%).

- **Initiation of breastfeeding**

Few babies were put to the breast immediately after delivery (26%), and most of the babies were not put to the breast, with no recording of the reason (60%) while there was no recording in initiation of breastfeeding in a few of the babies (14%).

- **Examination of the placenta**

The neonatal death rate was high if the placenta was stained yellow (67%), and even higher in those mothers who did not have any record of the placenta examination record (86%).

5.2.2.6 Section F – Neonatal care

This section comprised items pertaining to neonatal care. It should analyse the age of the baby when admitted, the reason for the admission and the problems on admission, the care given, identified maternal and neonatal risk factors, the causes of the baby's death and the number of days spend in the neonatal unit before discharge or death.

- **Age on admission**

The findings of the study ascertained that most of the babies were admitted within 6 hours of birth (73%) and they accounted for a lower percentage of the neonatal deaths (62%). The babies who were admitted between 6 and 24 hours of birth (7%) had a much higher death rate (86%), while those admitted between one to seven days only accounted for 50% of the neonatal deaths.

- **Reason for admission**

The most common reason for the babies' admission was birth asphyxia (40%), prematurity (30%) and neonatal infection (18%). The birth asphyxia accounted for 70% of deaths, prematurity for 67% of deaths, and neonatal infection and other reasons 40% of the neonatal deaths.

- **Problems identified on admission**

The study found that most of the babies were admitted with signs of respiratory distress (71%), and the majority of these babies died (66%), followed by babies presenting with signs of infection (11%) who accounted for 18% neonatal deaths.

- **Immediate management of problems**

Almost all babies who were admitted in the neonatal unit were referred to the doctor (99%).

- **Further assessment done to identify perinatal risk factors**

The majority of the babies were further assessed to identify perinatal risk factors (88%). It was found that maternal infections and the mother being HIV positive were the leading maternal risk factors (14%) which accounted for 54% and 46% of neonatal deaths respectively. Hypertensive disorders of pregnancy was the second leading maternal risk factor (11%), and this accounted for 50% of the neonatal deaths, combined with gestational diabetes, and unbooked babies who were born before arrival at the hospital. It is alarming to find that maternal risk factors were not recorded in 35% of cases, which accounted for 61% of neonatal deaths.

Neonatal risk factors were being preterm (29%), followed by meconium-stained liquor (25%) and being small for gestational age (10%). Preterm babies had a high mortality (72%), with meconium-stained liquor accounting for 68%.

- **The estimated gestational age**

The gestational age was estimated and it was found that the babies who were admitted in the neonatal unit were mostly term babies (49%), followed by preterm babies (37%). Postterm babies only accounted for 2% of the babies admitted, while 12% of the babies were not assessed for gestational age. As seen from the above discussion, there was a high mortality among preterm babies (70%) and lower mortality in term babies (45%) while there was much higher mortality in those babies who were not assessed for gestational age (100%).

- **Classification of infant according to weight for gestational age**

In the study, it was found that most of the babies were not classified according to the weight for gestational age (45%). The small-for-gestational-age babies accounted for 44% of the babies admitted, average-for-gestational-age babies (4%), and large-for-gestational-age babies (7%). Three-quarters of the average-for-gestational age had neonatal deaths (75%), small-for-gestational-age 57% and large-for-gestational-age accounted for 43%.

- **The primary causes of the baby's deaths**

Of the 60 babies who died in the neonatal unit, intrapartum asphyxia and birth trauma (39%) were the highest causes of neonatal deaths, followed by spontaneous preterm birth at 33%, infection (22%), antepartum haemorrhage and foetal abnormalities (3%).

- **Number of days in neonatal unit until discharge or death**

The majority of the babies spent less than seven days in the neonatal unit (68%). A high number of babies died within seven days (78%), while 22% of the babies died within a month. Intrapartum birth asphyxia and birth trauma were found to be the highest cause of death for babies who died within seven days (43%), followed by spontaneous preterm birth (36%) and infections (13%). It was found that in the babies, who died from intrapartum birth asphyxia and birth trauma, the Partogram was not used (except for 30%) and resuscitation was done on almost all of them (96%).

Of the 40 babies who were discharged alive, more than half were discharged within seven days (53%) and almost half of them were discharged within a month (47%).

5.3 CONCLUSIONS

From the findings of this study, the researcher came to the opinion that the high neonatal mortality was attributed to the following factors. These factors have been classified into antenatal care, intrapartum care and neonatal care.

5.3.1 Antenatal care

The researcher identified the following factors during antenatal care that are associated with high neonatal mortality:

- Mothers of younger age had a higher risk of neonatal deaths than older mothers.
- Low parity and gravidity had a more negative impact on the pregnancy outcome than parity and gravidity of above 4.
- Late booking was identified as a contributory factor in neonatal mortality.

- Unavailability of blood results during the antenatal care could be one reason why some of the problems were not picked up, such as positive RPR or HIV to mention a few; these could have been identified and managed and babies saved.
- Information given to pregnant mothers was found to be inadequate with regard to the monitoring of the foetal heart and the danger signs of pregnancy, as well as the place of delivery. In the researcher's opinion more consultation could have helped to ascertain whether the mothers were able to access the health institution easily or not and other arrangements discussed.
- Recording, or not carrying out the assessment, seemed to be a problem; in most of the records, the researcher could not tell whether the mothers had been assessed or not. This brought the researcher to the view that, 'what is not recorded is not done'.

5.3.2 Intrapartum care

During the intrapartum care, the researcher found the following factors to be mostly associated with neonatal mortality:

- Neglecting to review the antenatal history to identify risk factors, especially in the case of those mothers who were unbooked, is a cause for concern, as conditions that put mothers and babies at risk might be overlooked.
- Prolonged rupture of membranes impacted negatively on the outcome of the delivery.
- In all cases the labour should have been monitored by using the Partogram as a measure for evaluating the progress of labour; this would assist in identifying problems early so that correct management could be instituted.
- Not monitoring the latent phase of labour was shown to have a negative impact on the delivery outcome.
- The infrequent monitoring of the active phase of labour came out as a contributory factor that led to neonatal deaths.
- It was found that a normal foetal heart is not a guarantee of a positive outcome, irrespective of monitoring even with the cardiotocograph. This could be because the foetal heart was not considered in relation to the contractions.

- Poor progress, foetal distress and cephalopelvic disproportion seemed to be high among the identified problems during labour and had a negative impact on the delivery outcome.
- Omitting to report identified problems to the doctor or the next level of care seems to have contributed to neonatal mortality.
- Babies who were delivered by caesarean section had a higher mortality than those delivered vaginally. The researcher is of the opinion that this might be due to the lack of monitoring and reporting of labour as stated above.
- Most of the babies who had a low Apgar were born to mothers who had had a complicated delivery. Again, the researcher is of the view that the main reason for mothers ending up with complicated deliveries was lack of labour monitoring through the use of a Partogram, which could have identified and managed problems earlier, and also lack of reporting.
- Long resuscitation time resulted in a higher mortality than a shorter resuscitation time.
- Though there were only very few babies with congenital abnormalities (2%), the findings showed that the congenital abnormalities did have a negative impact on the survival of babies.
- A weight of below 1500 g was shown to be a higher risk for the survival of babies than a weight above 2500 g.

5.3.3 Neonatal care

The researcher found that the following factors are associated with the high neonatal mortality:

- Most babies were admitted within 24 hours. According to the researcher’s view, these admissions were attributable to intrapartum problems and these had a higher risk of neonatal mortality as compared to admissions after 24 hours.
- Birth asphyxia, prematurity and neonatal infections were identified as the main reasons for the babies’ admission and mortality.
- The leading maternal risk factors were identified as maternal infections, being HIV positive, hypertensive disorders of pregnancy and gestational diabetes.

- The leading neonatal risk factors were identified as being preterm, meconium-stained liquor and being small for gestational age.
- Of the babies who were admitted in the neonatal unit, more were term babies than preterm babies, but it was found that the preterm babies had a higher mortality than the term babies.
- The recording of classification of babies according to weight for gestational age, especially babies weighing below 2500g, was lacking in most cases. These babies might have a double risk of problems; for example, a preterm baby who is small for gestational age will have the problems of both preterm and small for gestational age babies.
- Intrapartum asphyxia, spontaneous preterm birth and infections were found to be leading causes of neonatal mortality.
- The first seven days could be identified as the critical time for the neonate. Most of the babies died within this period, mainly due to intrapartum asphyxia, spontaneous preterm birth and infections.

The researcher is of the opinion that the findings of this study identified many factors contributing to high neonatal mortality. These findings are consistent with other findings from studies in other countries and South Africa. Most of these factors could be prevented with better obstetric care and more rapid response to complications, as discussed in section 2.2.4.

5.4 LIMITATIONS OF THIS RESEARCH

The researcher found the following limitations in the study.

- The study had the potential limitations of a retrospective design.
- The study was only conducted in one district hospital in the Mpumalanga province, therefore the findings obtained cannot necessarily be generalised to other district hospitals, as they may have different infrastructure, development and geographical features.
- Other findings could possibly have been generated with the same sample if other research methods, such as interviews, had been used.

- The patient records were incomplete and the unavailability of some records was one of the constraints.
- Record keeping on documents was poorly done, both by medical and nursing staff, which could have affected the outcome of the findings.
- The gathering of data was tedious and time consuming, as the researcher was forced to access the files, gather data and file them back, and sometimes the files were needed during the course of data collection.

5.5 RECOMMENDATIONS

Based on the findings and conclusions of this study, the researcher made the following recommendations for improving patient care and for future research.

5.5.1 For the education

- Include in the medical and midwifery curricula at least extra hours for maternity and neonatal exposure, especially during their final year of study.
- Medical and midwifery students to be thoroughly trained on the use of the Partogram, interpretation of the findings and resuscitation of newborn babies.
- After completion of their studies, the medical and midwifery students to do internship of at least six months in maternity and neonatal units.
- All staff allocated in maternity to be orientated on the use of the Partogram, interpretation of findings and resuscitation of newborn babies.
- Training of all staff in the clinics who are delivering antenatal care, intrapartum care and newborn care in effective use of the Partogram, interpretation and resuscitation of newborn babies.
- Continuous development of all staff in the clinics and maternity units in the care of pregnant women, labouring women, resuscitation of newborn babies and newborn care through workshops, short courses, in-service training.

5.5.2 For the management

- Quality assurance by monitoring through record audits, perinatal morbidity and mortality review meetings.
- Motivating for training of health professionals conducting deliveries and caring for newborn babies in neonatal resuscitation and newborn care.
- Reviewing by management of the staffing of the maternity unit, taking into consideration the suggested staffing norms in the *Saving babies V: Fifth perinatal care survey in South Africa 2003–2005* (Pattinson 2003–2005).
- Reduction by management of the staff rotation for health professionals working in the maternity unit, especially those trained and in training in the Perinatal Education Programme, as well as experienced midwives.
- Increasing the number of registered midwives going for training in advanced midwifery and neonatal nursing science.
- Allocating adequate numbers of experienced and appropriately trained staff to antenatal clinics, maternity unit and neonatal unit.
- Putting into practice the recommendations from the perinatal morbidity and mortality review meetings to close gaps identified.
- Procuring appropriate equipment for the use in antenatal clinics, maternity unit and neonatal unit.
- Establishing and monitoring of clear referral routes for pregnant women and newborn babies.
- Updating of knowledge of health professionals attending to pregnant mothers and newborn babies, through in-service education programmes, short courses and workshops in relation to the assessment, identification of problems, management and referral of those mothers with risk factors, as well as the importance of documentation of the care rendered.
- Management should consider the interests and passion of the staff when allocating.

5.5.3 For clinical practice

- All health professionals attending to pregnant mothers and newborn babies must be able to assess, identify problems, manage and refer them appropriately.

- Making effective use of the Partogram for all mothers in labour, starting from latent phase until delivery for early detection of complications and management and/or referral as deemed necessary.
- All staff working in maternity and neonatal unit must be able to resuscitate newborn babies.
- All health professionals must use the standardized protocols in caring for pregnant mothers and newborn babies.
- All staff attending to patients must record properly after assessment, interpretation and management of the patients.
- All health professionals attending pregnant mothers and newborn babies, including sessional doctors should be involved and attend perinatal morbidity and mortality review meetings.

5.5.4 For the community

- Promoting early booking, at least before 12 weeks of gestation and initiating antenatal care on confirmation by informing women in all levels of care.
- Giving information on the danger signs of pregnancy and labour, mother to child transmission of HIV and place of delivery.
- Pregnant women should be made aware to plan ahead on how they will get to the health facility in time, i.e. plan transport mode.
- Giving information to the family/community about their responsibilities regarding pregnancy, i.e. use of contraceptives to prevent unplanned pregnancies.
- Taking responsibility for their own health, i.e. healthy eating to prevent small for gestational age babies, preventing the spread of HIV and sexually transmitted diseases by the use of condoms and seeking help in time.

5.5.2 For further research

The following recommendations are made regarding further research related to this topic:

- Repeating this study in other district hospitals in the province or other parts of South Africa, as this would assist in providing more reliable and valid results.

- A repeat study using the same sample after five years, to determine any improvement in the problems identified.
- Research into the perceptions of the health professionals caring for pregnant women with regard to factors contributing to neonatal mortality.
- Further research into the frequency of the use of Partogram in the early identification of complications, as recommended.
- Research into the knowledge and skills of health professionals caring for pregnant mothers and newborn babies.
- A study of job satisfaction of health professionals working in a maternity unit.

5.6 CONCLUSION

This chapter summarised and discussed the whole research project, including the limitations of the study and recommendations.

The objective of the research was to determine, through auditing of the records, the underlying contributory factors in an obstetric unit to neonatal deaths and to propose strategies for midwifery practice in order to prevent neonatal deaths.

The conclusions drawn from this study supported the assumptions that there are factors related to antenatal, labour and delivery care and postnatal and nursery care that contribute to neonatal deaths.

The findings of this research supported those found in the literature (see section 2.2.4) and by other researchers, thus emphasising the urgency for improving the care of pregnant mothers and their babies through effective implementation of programmes and protocols for pregnant mothers and their babies.

Recommendations were made, based on the findings of the research, to improve the quality of care of pregnant mothers and newborn babies in order to prevent or reduce high neonatal mortality.

Annexure A

University clearance certificate

Annexure B

Request for provincial permission

Annexure C

Provincial letter of approval

Annexure D

Request for hospital permission

Annexure E

Hospital letter of approval

Annexure F

Audit tool

Annexure G

Letter from editor

Annexure H

Letter from statistician

UNIVERSITY OF SOUTH AFRICA
Health Studies Research & Ethics Committee
(HSREC)
Faculty of Human Sciences
CLEARANCE CERTIFICATE

Date of meeting: 10 June 2007 Project No: 311 6041 7

Project Title: Factors Contributing to High Neonatal Death Rates in A District Hospital in the Mpumalanga Province

Researcher: Ms BP Ndlovu

Supervisor/Promoter: Mrs JE Tjallinks

Joint Supervisor/Joint Promoter: Prof SP Hattingh

Department: Health Studies

Degree: MA Health Studies

DECISION OF COMMITTEE

Approved	√	**Conditionally Approved**	

Date:

Prof TR Mavundla
RESEARCH COORDINATOR

Prof SM Mogotlane
ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

ANNEXURE B

PO Box 545
ACORNHOEK

23 September 2009

The Mpumalanga Ethics Committee
NELSPRUIT

Dear Sir/Madam

REQUEST TO CONDUCT RESEARCH AT TINTSWALO DISTRICT HOSPITAL IN ACORNHOEK LOCAL MUNICIPALITY, EHLANZENI DISTRICT IN MPUMALANGA

This letter serves to request for your permission to conduct research into: **The contributory factors of high neonatal death rate in a district hospital in Mpumalanga Province.**

I am presently registered with the University of South Africa and pursuing a Master's degree in Health Studies with specialisation in Advanced Midwifery and Neonatal Nursing Science by distance learning. This research is done to fulfill the requirement of the degree.

The neonatal records will be audited for data collection and the data derived from the audit used by the researcher in the research report. The quality of the data will be checked by the Quality Assurance manager of the hospital who will be requested by the researcher on completion of data collection.

The researcher assures that ethical issues shall by all means be adhered to through the execution of the research. Confidentiality and privacy will be maintained and the identity of the clients will not be linked to the information.

I hope that my request shall meet your favourable consideration.

Yours faithfully

____

Mrs Ndlovu B.P (Student number: 3116 041 7)
LECTURER

MPUMALANGA PROVINCIAL GOVERNMENT

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Riverside Park Extension 2
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Department of Health

Litiko Letemphilo | Umnyango WezaMaphilo | Departement van Gesondheid

Enquiries: Kate Mathe 3102

25 February 2010

Miss Bathusi Patricia Ndlovu
P O Box 545
Acornhoek
1360

Dear Miss Bathusi Patricia Ndlovu

APPLICATION FOR RESEARCH & ETHICS APPROVAL: FACTORS CONTRIBUTING TO HIGH NEONATAL DEATH RATE IN A DISTRICT HOSPITALS IN THE MPUMALANGA PROVINCE

The Provincial Research and Ethics Committee has approved your research proposal in the latest format that you sent. No issues of ethical consideration were identified.

Kindly ensure that you provide us with the report once your research has been completed.

Kind regards,

Machaba

Molefe Machaba
Research and Epidemiology

25-02-2010
Date

Mpumalanga PHREC
Chairperson: Dr Mosa Moshabela

25/02/2010
Date

We care. Do you?
Siyanakekela

MPUMALANGA
A Pioneering Spirit

MPUMALANGA PROVINCE
DEPARTMENT OF HEALTH
PLANNING & INFORMATION
2010 -02- 25
PRIVATE BAG X 11285
NELSPRUIT 1200

ANNEXURE D

PO Box 545
ACORNHOEK

23 September 2009

The Chief Executive Officer
Tintswalo Hospital
Private Bag X 407
ACORNHOEK

Dear Sir/Madam

REQUEST TO CONDUCT RESEARCH IN THE HOSPITAL

This letter serves to request for your permission to conduct research into: **The contributory factors of high neonatal death rate in a district hospital in Mpumalanga Province.**

I am presently registered with the University of South Africa and pursuing a Master's degree in Health Studies with specialisation in Advanced Midwifery and Neonatal Nursing Science by distance learning. This research is done to fulfill the requirement of the degree.

The neonatal records will be audited for data collection and the data derived from the audit used by the researcher in the research report. The quality of the data will be checked by the Quality Assurance manager of the hospital who will be requested by the researcher on completion of data collection.

The researcher assures the management that ethical issues shall by all means be adhered to through the execution of the research. Confidentiality and privacy will be maintained and the identity of the clients will not be linked to the information.

I hope that my request shall meet your favourable consideration.

Yours faithfully

____

Mrs Ndlovu B.P (Student number: 3116 041 7)
LECTURER

ANNEXURE F

FACTORS CONTRIBUTING TO HIGH NEONATAL DEATH RATES IN A DISTRICT HOSPITAL IN MPUMALANGA PROVINCE

SECTION A: FIRST ANTENATAL VISIT

1 PREVIOUS OBSTETRIC HISTORY

1.1 Client registration number

1	2	3

For official use

1.2 Age:

Age	Answer
1.2.1 ≤15 years	1
1.2.2 16 – 18 years	2
1.2.3 19 – 21 years	3
1.2.4 22 – 24 years	4
1.2.5 25 – 35 years	5
1.2.6 >35 years	6

	4

1.3 Antenatal booking status:

	Yes	No
1.3.1 Booking status	1	2

	5

1.4 Antenatal clinic attendance:

Clinic attended	Answer
1.4.1 Local	1
1.4.2 Hospital	2
1.4.3 Private practitioner	3
1.4.4 Specialist	4
1.4.5 Not recorded	5
1.4.6 Other, please state ……………………………	6

	6

1.5 Parity:

Parity	Answer
1.5.1 0	1
1.5.2 1 – 2	2
1.5.3 3 – 4	3
1.5.4 ≥5	4

	7

1.6 Gravidity:

Gravidity	Answer
1.6.1 1	1
1.6.2 2 – 3	2
1.6.3 4 – 5	3
1.6.4 >5	4

	8

1.7 Abortion:

	Yes	No
1.7.1 Abortion	1	2

	9

1.8 If yes, weeks of gestation, …………………….

	10

1.9 Stillbirth:

	Yes	No
1.9.1 Stillbirth	1	2

	11

1.10 Neonatal death:

	Yes	No
1.10.1 Neonatal death	1	2

	12

1.11 If yes, period of the neonatal death:

Days after birth	Answer
1.11.1 Within seven days	1
1.11.2 Within a month	2
1.11.3 Within two months	3
1.11.4 Not applicable	4

	13

1.12 Gestational age of previous pregnancies:

Gestational age	Answer
1.12.1 28 – 36 weeks	1
1.12.2 37 – 42 weeks	2
1.12.3 >42 weeks	3
1.12.4 Not recorded	4

	14

1.13 Place of delivery of previous babies:

Place of delivery	Answer
1.13.1 Home	1
1.13.2 Clinic	2
1.13.3 Hospital	3
1.13.4 Not recorded	4

	15

1.14 Weight of previous babies:

Weight	Answer
1.14.1 1000g – 2499g	1
1.14.2 500g – 4000g	2
1.14.3 >4000g	3
1.14.4 Not recorded	4

	16

1.15 Feeding method used:

Feeding method	Answer
1.15.1 Breastfeeding	1
1.15.2 Formula feeding	2
1.15.3 Other, please state, ………………………..	3
1.15.4 Not recorded	4

	17

1.16 Complications in the previous pregnancy, labour and puerperium:

	Yes	No
1.16.1 Complications in the previous pregnancy, labour and puerperium	1	2

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1.17 If yes, indicate complication:

Complication	Answer
1.17.1 Hypertensive disorders	1
1.17.2 Gestational diabetes	2
1.17.3 Preterm labour	3
1.17.4 Obstetric haemorrhages	4
1.17.5 Premature rupture of membranes	5
1.17.6 Infections	6
1.17.7 Prolonged labour	7
1.17.8 Assisted delivery	8
1.17.9 Other, please state, ……………………………..	9
1.17.10 None	10

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2 MEDICAL HISTORY

2.1 History of medical condition:

Medical condition	Answer
2.1.1 Cardiac	1
2.1.2 Diabetic	2
2.1.3 Hypertension	3
2.1.4 Kidney disease	4
2.1.5 Epilepsy	5
2.1.6 Tuberculosis	6
2.1.7 Liver disease	7
2.1.8 Allergies	8
2.1.9 Other, please state,…………………………….	9
2.1.10 None	10

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2.2 If yes, on treatment:

	Yes	No
2.2.1 Treatment	1	2

	30

2.3 If having allergy, what type of allergy:

Type of allergy	Answer
2.3.1 Food	1
2.3.2 Medications	2
2.3.3 Not recorded	3

	31

2.4 Lifestyle habits:

Lifestyle habits	Answer
2.4.1 Smoking	1
2.4.2 Alcohol	2
2.4.3 Other, please state, …………………………….	3
2.4.4 None	4

	32

2.6 Surgical history:

Type of surgery	Answer
2.6.1 General surgery	1
2.6.2 Gynaecological surgery	2
2.6.3 Obstetrical surgery	3
2.6.4 Other, please state,…………….........................	4
2.6.5 None	5

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3 FAMILY HISTORY

3.1 Family history:

Family history	Answer
3.1.1 Cardiac	1
3.1.2 Diabetic	2
3.1.3 Hypertension	3
3.1.4 Kidney disease	4
3.1.5 Epilepsy	5
3.1.6 Tuberculosis	6
3.1.7 Liver disease	7
3.1.8 Congenital abnormalities	8
3.1.9 Multiple pregnancy	9
3.1.10 Other, please state,……………………………..	10
3.1.11 None	11

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4 PRESENT OBSTETRIC HISTORY

4.1 Gestational age at initial visit to antenatal clinic:

Gestational age at initial visit	Answer
4.1.1 0 – 11 weeks gestation	1
4.1.2 12 – 16 weeks gestation	2
4.1.3 17 – 24 weeks gestation	3
4.1.42 5 – 28 gestation	4
4.1.5 >28 weeks gestation	5
4.1.6 Not recorded	6

	35

4.2 Method of contraception used:

Method of contraception	Answer
4.2.1 Oral contraceptives	1
4.2.2 Injectables	2
4.2.3 Other, please state,………………………………	3
4.2.4 Not recorded	4
4.2.5 Not used	5

	36

4.3 Fetal movements felt at:

Fetal movements	Answer
4.3.1 16 – 19 weeks	1
4.3.2 20 – 24 weeks	2
4.3.3 >24 weeks	3
4.3.4 Not recorded	4

	37

4.4 Sonar done for baseline information:

	Yes	No
Sonar done	1	2

	38

5 PHYSICAL EXAMINATION:

5.1 Height in centimeters:

Height in centimeters	Answer
5.1.1 <150cm	1
5.1.2 >150cm	2
5.1.3 Not recorded	3

	39

5.2 Weight in kilograms:

Weight in kilograms	**Answer**
5.2.1 <50kg	1
5.2.2 51kg – 70kg	2
5.2.3 >71kg	3
5.2.4 Not recorded	4

	40

5.3 Blood pressure in mmHg:

Blood pressure in mmHg	**Answer**
5.3.1 100/60 – 120/80	1
5.3.2 >121/80 – 130/90	2
5.3.3 >140/90	3
5.3.4 Not recorded	4

	41

5.4 Urine analysis:

Urine analysis	**Answer**
5.4.1 Protein	1
5.4.2 Glucose	2
5.4.3 Blood	3
5.4.4 Ketones	4
5.4.5 Leucocytes	5
5.4.6 Normal	6
5.4.7 Not recorded	7

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	48

5.5 Condition of teeth:

Condition of teeth	**Answer**
5.5.1 Dental caries	1
5.5.2 Loose teeth	2
5.5.3 Dentures	3
5.5.4 Normal	4
5.5.5 Not recorded	5

	49

5.6 Pallor:

Pallor	**Answer**
5.6.1 Pink	1
5.6.2 Pale	2
5.6.3 Cyanosed	3
5.6.4 Jaundiced	4
5.6.4 Not recorded	5

	50

5.7 Condition of thyroid:

Condition of thyroid	Answer
5.7.1 Enlarged	1
5.7.2 Normal	2
5.7.3 Not recorded	3

	51

5.8 Condition of breasts:

Condition of breast	Answer
5.8.1 Prominent nipples	1
5.8.2 Flat nipples	2
5.8.3 Soft	3
5.8.4 Lump	4
5.8.5 Not recorded	5

	52

5.9 Presence of oedema:

	Yes	No	Not recorded
5.9.1 Oedema	1	2	3

	52

5.10 If yes, indicate site of oedema:

Site of oedema	Answer
5.10.1 Legs	1
5.10.2 Face	2
5.10.3 Hands	3
5.10.4 Whole body	4
5.10.5 Not recorded	5

	53
	54
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	57

5.11 Examination abdomen:

Abdominal examination	Answer
5.11.1 Mass	1
5.11.2 Tenderness	2
5.11.3 Normal	3
5.11.4 Not recorded	4

	58

5.12 Examination of the lungs:

Lungs	**Answer**
5.12.1 Normal	1
5.12.2 Respiratory distress	2
5.12.3 Asthma	3
5.12.4 Tuberculosis	4
5.12.5 Not recorded	5

	59

5.13 Respiratory rate:

Respiratory rate	**Answer**
5.13.1 Normal	1
5.13.2 Dyspnoea	2
5.13.3 Tachypnoea	3
5.13.4 Shallow	4
5.13.5 Not recorded	5

	60

5.14 Pulse rate:

Pulse rate	**Answer**
5.14.1 60 – 100	1
5.14.2 >100	2
5.14.3 <60	3
5.14.4 Not recorded	4

	61

5.15 Symphysis Fundal Measurement:

Symphysis Fundal Measurement	**Answer**
5.15.1 Between 10^{th} and 90^{th} percentile	1
5.15.2 Above 90^{th} percentile	2
5.15.3 Below 10^{th} percentile	3
5.15.4 Not recorded	4

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6 INVESTIGATIONS

6.1 RPR or VDRL results:

	Positive	**Negative**	**Not recorded**
6.1.1 RPR/VDRL results	1	2	3

	63

6.2 If positive:

	Treated fully	**Incomplete treatment**	**Not treated**	**Not recorded**
6.2.1 If positive	1	2	3	4

	64

6.3 Rhesus factor checked:

	Positive	Negative	Not recorded
6.3.1 Rhesus factor	1	2	3

	65

6.4 Haemoglobin checked:

	12g/dl – 18g/dl	<12g/dl – 10g/dl	<10g/dl	Not recorded
6.4.1 Haemoglobin	1	2	3	4

	66

6.5 HIV tested:

	Positive	Negative	Not recorded
6.5.1 HIV test	1	2	3

	67

6.6 If positive, PMTCT:

	Mono therapy	Dual therapy	Referred	ART	Not recorded
6.6.1 PMTCT	1	2	3	4	5

	68

6.7 Supplements given:

	Yes	No	Not recorded
6.7.1 Supplements given	1	2	3

	69

6.8 Vaccines given:

	Yes	No	Not recorded
6.8.1 Vaccines given	1	2	3

	70

6.8.2 If yes, state the vaccines, ……………………………………..

	71

6.9 Risk grading done:

High risk	Medium risk	Low risk	Not recorded
1	2	3	4

	72

6.10 Antenatal follow ups:

	Clinic	CHC	District hospital	Regional hospital	Not recorded
6.10.1 ANC follow ups	1	2	3	4	5

	73

6.11 Delivery plan:

Clinic	Community health centre	District hospital	Regional hospital	Not recorded
1	2	3	4	5

	74

SECTION B: SUBSEQUENT ANTENATAL VISITS

7 Antenatal visits

7.1 Number of antenatal visits:

1 visit	2 visits	3 visits	>3 visits
1	2	3	4

	75

7.2 Write gestational age at each visit:

Antenatal visit	Gestational age
7.2.1 First visit	
7.2.2 Second visit	
7.2.3 Third visit	
7.2.4 Fourth visit	

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7.3 Fetal movements recorded:

	Normal	Abnormal	Not recorded
7.3.1 Fetal movements	1	2	3

	80

7.4 Blood pressure checked:

Blood pressure in mmHg	Answer
7.4.1 100/60 – 120/80	1
7.4.2 >121/81 – 130/90	2
7.4.3 >140/90	3
7.4.4 Not recorded	4

	81

7.5 Pulse rate checked:

Pulse rate	Answer
7.5.1 60 – 100	1
7.5.2 >100	2
7.5.3 <60	3
7.5.4 Not recorded	4

	82

7.6 Pallor:

Pallor	Answer
7.6.1 Pink	1
7.6.2 Pale	2
7.6.3 Cyanosed	3
7.6.4 Jaundice	4
7.6.4 Not recorded	5

	83

7.7 Symphysis fundal height measurement:

Symphysis Fundal Measurement	Answer
7.7.1 Between 10th and 90th percentile	1
7.7.2 Above 90th percentile	2
7.7.3 Below 10th percentile	3
7.7.4 Not recorded	4

	84

7.8 Measurement by palpation:

Palpation	Answer
7.8.1 <28 weeks	1
7.8.2 28 – 36 weeks	2
7.8.3 >37	3

	85

7.9 Sonar done:

	Yes	No
7.9.1 Sonar	1	2

	86

7.10 Pelvic assessment done:

	Yes	No
7.10.1 Pelvic assessment done	1	2

	87

7.11 Urine analysis:

Urine analysis	**Answer**
7.11.1 Protein	1
7.11.2 Glucose	2
7.11.3 Blood	3
7.11.4 Ketones	4
7.11.5 Leucocytes	5
7.11.6 Normal	6
7.11.7 Not recorded	7

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	94

7.12 HIV test done if refused test at initial visit:

	Positive	**Negative**	**Not recorded**
7.12.1 HIV testing	1	2	3

	95

7.13 Haemoglobin repeated at 32 and 38 weeks:

	12g/dl – 18g/dl	**<12g/dl – 10g/dl**	**<10g/dl**	**Not recorded**
7.13.1 Haemoglobin at 32 weeks	1	2	3	4
7.13.2 Haemoglobin at 38 weeks	1	2	3	4

	96
	97

7.14 Repeat information for danger signs of pregnancy:

	Yes	**No**	**Not recorded**
7.14.1 Information on dangers signs of pregnancy	1	2	3

	98

7.15 Delivery plan reviewed:

	Yes	**No**	**Not recorded**
7.15.1 Delivery plan	1	2	3

	99

SECTION C: ADMISSION IN LABOUR

8 Admission in labour

8.1 Antenatal risk factors noted:

	Yes	No	Not recorded
8.1.1 ANC risk factors	1	2	3

	100

8.2 If woman unbooked, antenatal history taken:

	Yes	No	Not recorded	Not applicable
8.2.1 Antenatal history	1	2	3	4

	101

8.3 HIV status recorded:

	Positive	Negative	Not recorded
8.3.1 HIV status	1	2	3

	102

8.4 If HIV status not known, Voluntary Counseling and Testing done:

	Yes	No	Not recorded	Not applicable
8.4.1 VCT done if HIV status not known	1	2	3	4

	103

8.5 Fetal movements checked:

	Absent	Diminished	Normal	Not recorded
8.5.1 Fetal movements	1	2	3	4

	104

8.6 Rupture of membranes:

	Intact	Spon-taneous rupture	Artificial rupture	Not recorde d
8.6.1 Rupture of membranes	1	2	3	4

	105

8.7 Condition of liquor:

	Clear	Meconium stained	Offensive	Not recorded	Not applicable
8.7.1 Colour of liquor	1	2	3	4	

	106
	107

8.8 Duration of rupture of membranes:

	Less than 4 hours	5 hours – 24 hours	More than 24 hours	Not recorded	Not applicable
8.8.1 Duration of rupture of membranes	1	2	3	4	5

	108

8.9 Temperature checked and recorded:

	36°C - 37°C	<36°C	>37°C	Not recorded
8.9.1 Temperature	1	2	3	4

	109

8.10 Blood pressure checked and recorded:

Blood pressure in mmHg	**Answer**
8.10.1 100/60 – 120/80	1
8.10.2 >121/81 – 130/90	2
8.10.3 >140/90	3
8.10.4 Not recorded	4

	110

8.11 Oedema observed:

Site of oedema	**Answer**
8.11.1 Legs	1
8.11.2 Face	2
8.11.3 Hands	3
8.11.4 Whole body	4
8.11.5 None	5

	111

8.12 Pallor:

Pallor	**Answer**
8.12.1 Pink	1
8.12.2 Pale	2
8.12.3 Cyanosed	3
8.12.4 Jaundiced	4
8.12.4 Not recorded	5

	112

8.13 Abdominal examination:

8.13.1 Symphysis Fundal Height:

Symphysis Fundal Measurement	**Answer**
8.13.1.1 Between 10th and 90th percentile	1
8.13.1.2 Above 90th percentile	2
8.13.1.3 Below 10th percentile	3
8.13.1.4 Not recorded	4

	113

8.13.2 Palpation:

Palpation	**Answer**
8.13.2.1 <28 weeks	1
8.13.2.2 28 – 36 weeks	2
8.13.2.3 >37 weeks	3

	114

8.13.3 Lie of the fetus:

Lie of the fetus	**Answer**
8.13.3.1 Longitudinal	1
8.13.3.2 Oblique	2
8.13.3.3 Transverse	3
8.13.3.4 Not recorded	4

	115

8.13.4 Presentation:

Presentation	**Answer**
8.13.4.1 Cephalic	1
8.13.4.2 Breech	2
8.13.4.3 Face	3
8.13.4.4 Brow	4
8.13.4.5 Not recorded	5

	116

8.13.5 Position:

Position	Answer
8.13.5.1 Anterior position	1
8.13.5.2 Posterior position	2
8.13.5.3 Not recorded	3

	117

8.13.6 Attitude:

Attitude	Answer
8.13.6.1 Flexed	1
8.13.6.2 Deflexed	2
8.13.6.3 Extended	3
8.13.6.4 Not recorded	4

	118

8.13.7 Level of presenting part in fifths above the pelvic brim:

Level of presenting part	Answer
8.13.7.1 5/5	1
8.13.7.2 4/5	2
8.13.7.3 3/5	3
8.13.7.4 2/5	4
8.13.7.5 1/5	5
8.13.7.6 0/5	6
8.13.7.7 Not recorded	7

	119

8.13.8 Liquor volume:

Liquor volume	Answer
8.13.8.1 Adequate	1
8.13.8.2 Polyhydramnios	2
8.13.8.3 Oligohydramnios	3
8.13.8.4 Not recorded	4

	120

8.13.9 Uterine tone:

Uterine tone	Answer
8.13.9.1 Soft	1
8.13.9.2 Rigid	2
8.13.9.3 Tender	3
8.13.9.4 Not recorded	4

	121

8.13.10 Strength of contractions:

	No contrac-tions	Mild	Mode-rate	Strong	Not recorded
8.13.10.1 Strength of contractions	1	2	3	4	5

	122

8.13.11 Fetal heart rate:

	120 – 160b/min	<120b/min	>160b/min	Not recorded
8.13.11.1 Fetal heart rate	1	2	3	5

	123

8.13.12 Estimation of fetal weight:

	<2.499kg	2.5kg – 4kg	>4kg	Not recorded
8.13.12.1 Estimated fetal weight	1	2	3	4

	124

8.14 Vaginal examination:

	Done	Not done
8.14.1 Vaginal examination	1	2

	125

8.15 If vaginal examination was done, complete the following questions:

8.15.1 Condition of vulva and vagina:

Condition of vulva and vagina	Answer
8.15.1.1 Healthy	1
8.15.1.2 Sores/warts	2
8.15.1.3 Oedematous	3
8.15.1.4 Not recorded	4

	126

8.15.2 Cervix:

Cervix	Answer
8.15.2.1 Uneffaced	1
8.15.2.2 Effacing	2
8.15.2.3 Fully effaced	3
8.15.2.4 Not recorded	4

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8.15.3 Position of cervix:

Position of cervix	Answer
8.15.3.1 Posterior	1
8.15.3.2 Middle	2
8.15.3.3 Anterior	3
8.15.3.4 Not recorded	4

	128

8.15.4 Consistency of cervix:

Consistency of cervix	Answer
8.15.4.1 Firm	1
8.15.4.2 Soft	2
8.15.4.3 Not recorded	3

	129

8.15.5 Dilatation of cervix:

Dilatation of cervix	Answer
8.15.5.1 ≤ 3cm	1
8.15.5.2 4 – 8 cm	2
8.15.5.3 9 – 10cm	3
8.15.5.4 Not recorded	4

	130

8.15.6 Rupture of membranes:

Rupture of membranes	Answer
8.15.6.1 Intact	1
8.15.6.2 Spontaneous rupture	2
8.15.6.3 Artificial rupture	3
8.15.6.4 Not recorded	4

	131

8.15.7 Condition of liquor:

Condition of liquor	Answer
8.15.7.1 Clear	1
8.15.7.2 Meconium stained	2
8.15.7.3 Offensive	3
8.15.7.4 Not recorded	4

	132

8.15.8 Duration of rupture of membranes:

	Less than 4 hours	5 hours – 24 hours	More than 24 hours	Not recorded
8.15.8.1 Duration of rupture of membranes	1	2	3	4

	133

8.15.9 Presenting part:

Presenting part	Answer
8.15.9.1 Vertex	1
8.15.9.2 Face	2
8.15.9.3 Brow	3
8.15.9.4 Breech	4
8.15.9.5 Other:……………………………………	5
8.15.9.6 Not recorded	6

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8.15.10 Position:

Position	Answer
8.15.10.1 Anterior position	1
8.15.10.2 Posterior position	2
8.15.10.3 Not recorded	3

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8.15.11 Moulding:

Moulding	Answer
8.15.11.1 Absent	1
8.15.11.2 Parieto – parietal moulding	2
8.15.11.3 Occipito – parietal moulding	3
8.15.11.4 Not recorded	4

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8.15.12 Caput:

Caput	Answer
8.15.12.1 Absent	1
8.15.12.2 Present	2
8.15.12.3 Not recorded	3

	137

8.15.12 Descent of fetal head:

Descent		Answer
8.15.12.1	- 1 station	1
8.15.12.2	0 station	2
8.15.12.3	+ 1 station	3
8.15.12.4	+ 2 station	4
8.15.12.5	Not recorded	5

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8.16 Pelvic assessment:

8.16.1 Pelvic assessment done:

	Yes	No
8.16.1.1 Pelvic assessment	1	2

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8.16.2 Condition of pelvis:

Pelvis	**Answer**
8.16.2.1 Adequate	1
8.16.2.2 Borderline	2
8.16.2.3 Inadequate	3
8.16.2.4 Not recorded	4

	140

8.17 Investigations:

8.17.1 Urine analysis:

Urine analysis	**Answer**
8.17.1.1 Protein	1
8.17.1.2 Glucose	2
8.17.1.3 Blood	3
8.17.1.4 Ketones	4
8.17.1.5 Leucocytes	5
8.17.1.6 Normal	6
8.17.1.7 Not recorded	7

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8.17.2 Blood investigations collected if unbooked:

Blood investigation	Answer
8.17.2.1 Haemoglobin	1
8.17.2.2 Rhesus Factor	2
8.17.2.3 Blood Grouping	3
8.17.2.4 VDRL/RPR	4
8.17.2.5 HIV	5
8.17.2.6 Not recorded	6
8.17.2.7 Not applicable	7

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SECTION D: INTRAPARTUM CARE

9 Intrapartum care

9.1 Partogram used:

	Yes	No	Not recorded
9.1.1 Partogram used	1	2	3

	155

9.2 If the answer to 9.1 is “yes”, record the following questions:

9.2.1 Latent phase of labour monitored:

	Yes	No	Not recorded
9.2.1.1 Latent phase monitored	1	2	3

	156

9.2.2 Blood pressure and pulse 4 hourly:

	Yes	No	Infre-quent	Not recorded
9.2.2.1 Blood pressure and pulse 4 hourly	1	2	3	4

	157

9.2.3 Blood pressure recording:

Blood pressure in mmHg	Answer
9.2.3.1 100/60 – 120/80	1
9.2.3.2 >121/81 – 130/90	2
9.2.3.3 >140/90	3
9.2.3.4 Not recorded	4

	158

9.2.4 Temperature 4 hourly:

	Yes	No	Infre-quent	Not recorded
9.2.4.1 Temperature 4hourly	1	2	3	4

	159

9.2.5 Temperature recording:

	Normal	Subnormal	Pyrexia	Not recorded
9.2.5.1 Temperature recording	1	2	3	4

	160

9.2.6 Uterine contractions 2 hourly:

	Yes	No	Infre-quent	Not recorded
9.2.6.1 Uterine contractions checked 2 hourly	1	2	3	4

	161

9.2.7 Strength of contractions:

	No contrac-tions	Mild	Moderate	Strong	Not recorded
9.2.7.1 Strength of contractions	1	2	3	4	5

	162

9.2.8 Fetal heart rate 2 hourly:

	Yes	No	Infre-quent	Not recorded
9.2.8.1 Fetal heart rate 2 hourly	1	2	3	4

	163

9.2.9 Fetal heart rate recording:

	120 – 160b/min	<120b/min	>160b/min	Not recorded
9.2.9.1 Fetal heart rate recording	1	2	3	5

	164

9.2.10 Vaginal examination 4 hourly:

	Yes	No	Infre-quent	Not recorded
9.2.10.1 Vaginal examination 4 hourly	1	2	3	4

	165

9.2.11 Progress of labour:

	Good	Poor	Not recorded
9.2.11.1 Progress of labour	1	2	3

	166

9.3 Active phase of labour monitored:

9.3.1 Active phase of labour recorded:

	Yes	No	Infre-quent	Not recorded
9.3.1.1 Active phase of labour monitored	1	2	3	4

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9.3.2 Maternal condition monitored:

	Yes	No	Infre-quent	Not recorded
9.3.2.1 Maternal condition monitored	1	2	3	4

	168

9.3.3 Blood pressure hourly:

Blood pressure in mmHg	Answer
9.3.3.1 100/60 – 120/80	1
9.3.3.2 >121/81 – 130/90	2
9.3.3.3 >140/90	3
9.3.3.4 Not recorded	4

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9.3.4 Temperature 4 hourly:

	<36 °C	**36.5°C – 37.2°C**	**37.3°C - 37.9°C**	**>38°C**	**Not recorded**
9.3.4.1 Temperature 4 hourly	1	2	3	4	5

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9.3.5 Urine analysis done 2 hourly:

Urine analysis	**Answer**
9.3.5.1 Protein	1
9.3.5.2 Glucose	2
9.3.5.3 Blood	3
9.3.5.4 Ketones	4
9.3.5.5 Leucocytes	5
9.3.5.6 Normal	6
9.3.5.7 Not recorded	7

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9.3.6 Urine volume 2 hourly:

	≥30ml/hour	**Less than 30ml/hour**	**Anuria**	**Not recorded**
9.3.6.1 Urine volume done 2 hourly	1	2	3	4

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9.3.7 Fetal condition monitored:

	Yes	**No**	**Infre-quent**	**Not recorded**
9.3.7.1 Fetal condition monitored	1	2	3	4

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9.3.8 Fetal heart rate ½ hourly:

	120 – 160b/min	**<120b/min**	**>160b/min**	**Not recorded**
9.3.8.1 Fetal heart rate ½ hourly	1	2	3	4

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9.3.9 Cardiotocograph used:

	Yes	No
9.3.9.1 Cardiotocograph	1	2

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9.3.10 Condition of liquor 2 hourly if membranes ruptured:

Condition of liquor 2hourly	**Answer**
9.3.10.1 Clear	1
9.3.10.2 Meconium stained	2
9.3.10.3 Offensive	3
9.3.10.4 Not recorded	4

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9.3.11 Progress of labour monitored:

	Regularly	Infre-quently	Not recorded
9.3.11.1 Progress of labour monitored	1	2	3

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9.3.12 Frequency and strength of uterine contractions hourly:

	No contrac-tions	Mild	Mode-rate	Strong	Not recorded
9.3.12.1 Frequency and strength of uterine contractions hourly	1	2	3	4	5

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9.3.13 Level of the presenting part:

Descent	**Answer**
9.3.13.1 - 1 station	1
9.3.13.2 0 station	2
9.3.13.3 + 1 station	3
9.3.13.4 + 2 station	4
9.3.13.5 Not recorded	5

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9.3.14 Cervical dilatation 2 hourly:

Dilatation	**Answer**
9.3.14.1 1cm per hour in primigravid	1
9.3.14.2 2cm per hour in multipara	2
9.3.14.3 Less than the above	3
9.3.14.4 More than the above	4
9.3.14.5 Not recorded	5

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9.3.15 Caput 2 hourly:

Caput	**Answer**
9.3.15.1 Absent	1
9.3.15.2 Present	2
9.3.15.3 Not recorded	3

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9.3.16 Moulding 2 hourly:

Moulding 2 hourly	**Answer**
9.3.16.1 Absent	1
9.3.16.2 Parieto – parietal moulding	2
9.3.16.3 Occipito – parietal moulding	3
9.3.16.4 Not recorded	4

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9.3.17 Treatment given during labour:

	Anti-biotics	**Sedatives/ analgesia**	**Oxyto-cin**	**IV fluids**	**Not recorded**
9.3.17.1 Treatment given during labour	1	2	3	4	5

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9.3.18 Identified problems recorded:

Identified problems	**Answer**
9.3.18.1 Maternal exhaustion	1
9.3.18.2 Cephalopelvic disproportion	2
9.3.18.3 Fetal distress	3
9.3.18.4 Malpresentation	4
9.3.18.5 Other; specify ……………………………	5
9.3.18.6 Not recorded	6

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9.3.19 Proposed management:

	Referred	Not referred	Not recorded
9.3.19.1 Proposed management	1	2	3

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SECTION E: MANAGEMENT OF THE 2ND STAGE

10 Management of the 2nd stage recorded

10.1 Method of delivery:

	Normal vaginal delivery	Caesarean Section	Vacuum delivery	Forceps delivery
10.1.1 Method of delivery	1	2	3	5

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10.2 Complications during delivery:

	Yes	No
10.2.1 Complications	1	2

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10.2.2 If yes, please specify;…………………………………..

10.3 Apgar scoring assessment in one minute and five minutes:

Apgar score		Answer
1 minute	5 minute	
10.3.1 < 3/10	< 3/10	1
10.3.2 3 – 6/10	3 – 6/10	2
10.3.3 >7/10	>7/10	3
10.3.4 Not recorded	Not recorded	4

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10.4 Resuscitation needed:

	Yes	No	Not recorded
10.4.1 Resuscitation needed	1	2	3

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10.5 If yes, steps taken to resuscitate the baby:

Steps taken for resuscitation	Answer
10.5.1 Suctioning only	1
10.5.2 Suctioning and bag and mask ventilation	2
10.5.3 Suctioning and intubation	3
10.5.4 Ventilation and cardiac massage	4
10.5.5 Drugs given	5
10.5.6 Not recorded	6
10.5.7 Not applicable	7

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10.6 Duration of resuscitation:

	< Five minutes	Five – ten minutes	> Ten minutes	Not recorded
10.6.1 Duration of resuscitation	1	2	3	5

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10.7 Prophylactic drugs given:

	Konakion	Eye ointment	Nevirapine	AZT	Not recorded
10.7.1 Prophylactic drugs given	1	2	3	4	5

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10.8 Congenital abnormalities present:

	Yes	No	Not recorded
10.8.1 Congenital abnormalities present	1	2	3

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10.9 Baby's weight:

Baby's weight	**Answer**
10.9.1 1000g – 1499g	1
10.9.2 1500g – 1999g	2
10.9.3 2000g – 2499	3
10.9.4 >2500g	4
10.9.5 Not recorded	5

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10.10 Duration of labour:

Duration of labour	**Answer**
10.10.1 <4 hours	1
10.10.2 5 – 10 hours	2
10.10.3 11 – 18 hours	3
10.10.4 >18 hours	4
10.10.5 Not recorded	5

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10.11 Breastfeeding initiated:

	Yes	**No**	**Not recorded**
10.11.1 Breastfeeding initiated	1	2	3

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11 Third stage

11.1 Blood loss:

Blood loss	**Answer**
11.1.1 <150ml	1
11.1.2 155ml 490ml	2
11.1.3 > 500ml	3
11.1.4 Not recorded	4

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11.2 Examination of placenta

Placenta	**Answer**
11.2.1 Complete	1
11.2.2 Incomplete	2
11.2.3 Ragged	3
11.2.4 Pale	4
11.2.5 Yellow stained	5
11.2.6 Other, please state;……………………	6

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SECTION F: NEONATAL CARE

12 Neonatal care

12.1 Age on admission:

Age	Answer
12.1.1 <6 hours	1
12.1.2 6 – 24 hours	2
12.1.3 1 – 7days	3
12.1.4 >7 days	4
12.1.5 Not recorded	5

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12.2 Reason for admission:

Reason for admission	Answer
12.2.1 Birth asphyxia	1
12.2.2 Prematurity	2
12.2.3 Neonatal infection	3
12.2.4 Other, please state …………………	4
12.2.5 Not recorded	5

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12.3 Problems on admission:

Problems on admission	Answer
12.3.1 Signs of respiratory distress: Tachypnoea, recession, grunting, cyanosis, nasal flaring	1
12.3.2 Signs of shock: Bleeding, pallor	2
12.3.3 Hypoglycaemia	3
12.3.4 Convulsions	4
12.3.5 Signs of infection: Jaundice, hypothermia, vomiting, distended abdomen	5
12.3.6 Failure to suck	6
12.3.7 Not recorded	7

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12.4 Appropriate immediate management of problems done:

	Referred	**Not referred**	**Not recorded**
12.4.1 Appropriate immediate management done	1	2	3

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12.5 Further assessment done to identify perinatal risk factors:

	Yes	**No**	**Not recorded**
12.5.1 Assessment done	1	2	3

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12.6 Maternal risk factors:

Maternal risk factors	**Answer**
12.6.1 Maternal infections	1
12.6.2 Hypertensive disorders of pregnancy	2
12.6.3 Gestational diabetes	3
12.6.4 Assisted delivery	4
12.6.5 Other, please state;………………………………	5
12.6.6 Not recorded	6

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12.7 Neonatal risk factors:

Neonatal risk factors	**Answer**
12.7.1 Meconium stained liquor	1
12.7.2 Small for gestational age	2
12.7.3 Preterm	3
12.7.4 Large for gestational age	4
12.7.5 Postterm	5
12.7.6 Other, please specify: …………………………….	6

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12.8 The estimated gestational age:

Gestational age	**Answer**
12.8.1 Preterm	1
12.8.2 Term	2
12.8.3 Postterm	3
12.8.4 Not recorded	4

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12.9 Classification of infant according to weight for gestational age:

Classification	**Answer**
12.9.1 Small for gestational age	1
12.9.2 Average for gestational age	2
12.9.3 Large for gestational age	3
12.9.4 Not recorded	4

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12.10 The primary causes of the baby's death:

Primary causes	Answer
12.10.1 Spontaneous preterm birth	1
12.10.2 Intrapartum asphyxia and birth trauma	2
12.10.3 Fetal abnormality	3
12.10.4 Infections	4
12.10.5 Hypertension	5
12.10.6 Ante-partum haemorrhage	6
12.10.7 Idiopathic intrauterine growth restriction	7
12.10.8 Pre-existing maternal disease	8
12.10.9 Other, please state;………………………	9
12.10.10 Not recorded	10

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12.11 Number of days in neonatal unit until discharge or death:

Number of days	Answer
12.11.1 <7days	1
12.11.2 ≤one month	2
12.11.3 ≥two months	3
12.11.4 Not recorded	4

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EDITING CERTIFICATE – MRS BATHUSI NDLOVU

I hereby certify that I edited Chapter 4 of Mrs Ndlovu's dissertation, as requested by Mrs Marion Marchand. This was language editing only, as I have no expertise as regards the contents of her work. Although I had access to the chapters edited by Mrs Marchand, I was only able to glance through these, owing to time constraints. I did impress upon Mrs Ndlovu the importance of ensuring consistency between my editing and Mrs Marchand's.

I did not edit or check the content of the references, again owing to time constraints, but stressed to Mrs Ndlovu that the accuracy of the references and the bibliography was her responsibility.

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STATISTICAL
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1 February 2011

To whom it may concern

I conducted the statistical analysis for Bathusi P Ndlovu for her Master's dissertation in completion of the degree: **MA (HEALTH STUDIES)** at the University of South-Africa.

The title of the dissertation is:
THE CONTRIBUTORY FACTORS OF HIGH NEONATAL DEATH RATE IN A DISTRICT HOSPITAL IN MPUMALANGA PROVINCE

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