

Chapter 2

Literature review

2.1 INTRODUCTION

A literature review is important in the research process as it helps the researcher to identify the research topic by identifying gaps in the existing research and to develop a conceptual framework and conduct of research. Literature review is done before, during and after the research to build on existing research and compare the findings. The main purpose of a literature review is to find similar studies; familiarize oneself with practical and theoretical issues related to the phenomenon of interest; generate a picture on information available on the topic, and prevent unintentional duplication. It also assists the researcher to compile a written report on what is known about the topic (Burns & Grove 2001:133; Polit & Hungler 2001:127).

The researcher conducted a literature review on the following: knowledge of women attending antenatal clinics have on transmission of HIV, including background information on HIV status in the world and Africa; risks associated with infant feeding methods, the WHO and UN recommendations on infant feeding methods in the prevention of HIV/AIDS transmission and preventive measures in use for MTCT of HIV/AIDS.

2.2 HIV SITUATION IN THE WORLD

It is estimated that about 42 million people are living with HIV; six million people are HIV infected in a year, 500 000 children die annually from AIDS-related illnesses and about 16 000 people are HIV infected each day (Jackson 2002:12; UNAIDS 2004:1).

The Joint United Nations programme on HIV/AIDS states that 90-95% of the people infected with HIV in the world live in African countries, which are poor and cannot afford antiretroviral drugs and formula milk supplies to prevent MTCT of HIV through breast-feeding (UNAIDS 2004:1). In addition, Sub-Saharan Africa has more women than men

living with HIV, thus 57% of adults infected are women, and 75% of young people infected are women and girls (National AIDS Agency [NACA] Central Statistics Office [CSO] 2004:23). Furthermore, in 2001, the HIV prevalence rates of pregnant women in Swaziland and Botswana were 39% and 36%, respectively (NACA & CSO 2004:23). The high numbers of women living with HIV represent babies at risk of HIV transmission through breast-feeding.

2.3 PROGRAMMES TO PREVENT MTCT IN BOTSWANA

The Botswana government has PMTCT, HAVARD, and BAYLOR programmes and other projects in place to prevent HIV/AIDS transmission from mother to child.

2.3.1 PMTCT programme

The Botswana government introduced the PMTCT programme in 1998 to reduce the HIV/AIDS prevalence rate in pregnant women (Baggley et al 2002:55; Lewis 2001:5). The PMTCT programme was started in the major cities of the country, Francistown and Gaborone, in April 1999 and was rolled out to other districts in 2000. The main aim of the programme is to prevent MTCT of HIV before and during pregnancy, during labour and breast-feeding. The programme activities include:

- **Pre- and post-test counselling.** Women/couples wanting to have a baby and all pregnant women are pre- and post-test counselled on HIV in order to make an informed decision on whether to conceive or to keep the pregnancy to full-term or not, or join the PMTCT programme and choose an appropriate infant feeding method. The women are counselled on the recommended infant feeding methods. In Botswana HIV-positive women not willing to use formula replacement feeding are advised to exclusively breast-feed their children for 3 to 6 months with abrupt cessation at 3 to 6 months and to immediately introduce formula milk feeding for a period of 1 year. The other recommended feeding method is exclusive formula feeding for 3 to 6 months with introduction of supplementary feeding at 3 to 6 months. HIV-negative mothers are encouraged to breast-feed for 3 to 6 months, introduce other foods after 3 to 6 months, and continue breast-feeding for 1 to 2 years or as desired by the mother.

- The programme also provides free formula milk to HIV-positive mothers enrolled in the PMTCT programme who opt to formula feed and those who practise exclusive breast-feeding for the first 3 to 6 months and want to change to formula milk replacement feeding thereafter.
- HIV-infected pregnant women are supplied with free Zidovudine (AZT) antiretroviral therapy from 28 weeks' gestation throughout pregnancy and every 3 hours during delivery to prevent MTCT of HIV.
- All HIV-positive pregnant women are put on Isoniazid preventive therapy for 1 year after delivery to prevent tuberculosis (TB), (another most) common opportunistic infection in HIV-positive persons.
- Babies born from HIV-positive mothers are put on Zidovudine (AZT) syrup for 1 month to prevent replication of HIV contracted from the mother.
- The PMTCT programme also closely monitors the health, growth and development of babies born from HIV-positive mothers for 2 years as well as to determine the number of children who seroconvert. Seroconversion relates to the HIV-negative babies born from HIV-positive mothers who become HIV positive after delivery. An HIV test is done at 18 months. Unless there are suspicions of HIV infections earlier in their developmental stage the test would be done earlier to assess the HIV status of the children born from HIV-positive mothers.
- Babies born from HIV-positive women are also supplied with cotrimazole three times a week for six months to prevent pneumocystic carinii pneumonia (PCP), another common HIV opportunistic infection in HIV positive individuals.
- All HIV-positive babies and pregnant women enrolled in PMTCT programme with a CD4 count of less than 200 or with one or two opportunistic infections are started on Highly Active Antiretroviral Therapy (HAART).

According to Lewis (2001:1-5), an evaluation of the PMTCT programme on HIV-positive mothers found that:

- Eighty-nine percent (89%) (141) of the 158 mothers chose formula feeding.
- Ten (6.3%) chose breast-feeding and only 20% of these managed to exclusively breast-feed their infants.

- Eight (5%) women who were not aware of their HIV status or not willing to be tested for HIV opted to formula feed their infants.
- Some mothers abandoned formula milk supplies in the clinics and others preferred to purchase the formula milk from the chemist for fear of stigma and discrimination.
- There was an increased number of caesarian section deliveries in PMTCT sentinel sites, although this method of delivery was not voluntarily chosen by pregnant mothers to reduce the risk of HIV transmission.
- Seventy-six percent (76%) of mothers at PMTCT sites breast-fed their infants, while 95% breast-fed at non-PMTCT sites thus indicating a substantial “spill-over” effect (Lewis 2001:4). Spill-over refers to those women who were uninfected, not aware of their HIV status or not willing to be tested for HIV but opted to formula feed their infants. To reduce the spill-over effect, a study done in the Ivory Coast stated that only women who tested HIV positive were counselled on replacement infant feeding method (Rutenberg, Baek, Kalibala & Rosen 2003b:25).

Creek, Ntuny, Mazhani, Moore, Smith, Schaffer and Kilmarx (2003:1) found a low uptake of PMTCT programme in Francistown and that 40% of the health workers were reluctant to convince women to test for HIV. Several of the health workers were not willing to counsel the clients and tell women that they were HIV positive.

2.3.2 Harvard programme

The Harvard University, USA, in partnership with the Botswana government introduced the Botswana Harvard Project to conduct HIV/AIDS-related research and offer technical support. The project is scheduled to run for 5 years, provide training to health professionals and conduct HIV/AIDS-related research. Project activities include:

2.3.2.1 MASHI study

The *MASHI* study (*mashi* is a Setswana word meaning “milk”) started in March 2001 and enrolled 1200 mothers from Molepolole, Mochudi, Lobatse and Gaborone areas. The aim of the study was to determine whether breast-feeding and AZT for 6 months prophylaxis was as safe and effective as 1 month AZT. Mothers who were breast-

feeding and formula feeding were followed up and their health monitored. The project aimed at identifying those children who seroconvert while breast-feeding or complementary formula feeding, exclusively breast-feeding or while wet nursing (Thior 2004:3). In the first two years of the study in Molepolole, it was found that there was a low adherence of mothers to the chosen infant feeding method due to cultural norms, which encourage breast-feeding and mixed feeding. The mothers who had either chosen exclusive replacement formula feeding or exclusive breast-feeding practised mixed feeding instead of the chosen infant feeding method. Thus, 32% (11) of the 34 women who had chosen to formula feed, breast fed their children and only 11% (4) of the 31 women who had chosen exclusive breast-feeding managed to adhere to the initially chosen feeding method (Shapiro, Lockman, Thior, Kebaabetswe, Wester, Gilbert, Marlink, Essex & Heyman 2005:7-10).

2.3.2.2 *Maiteko a Tshireletso vaccine initiative*

Another project that the Harvard project focuses on is the ***Maiteko a Tshireletso*** (means protection efforts in Setswana) vaccine initiative. The HIV vaccine initiative study is done by Harvard project in conjunction with the Ministry of Health. The *Maiteko a Tshireletso* vaccine initiative was launched in Gaborone Botswana on 26 June 2003. The study has 14 volunteers vaccinated with HIV type C vaccine that will be followed up for 18 months. In this study, some of the volunteers are given HIV vaccine, another group given three to four HIV vaccines type B, and C and placebo injections. The participants are monitored for 5 years development of HIV antibodies and side effects. The study is being conducted in the following countries: North America, South America, Brazil, the Caribbean, Haiti Kingston, Jamaica, Cape Town and Soweto in South Africa. The outcome of this study could lead to development of a vaccine for HIV for both Africa and European countries (The Body 2005:2; Thior 2004:3).

2.3.2.3 *Tshepo adult antiretroviral drug resistance, antiretroviral efficacy, behavioral and social science study*

Tshepo means "hope" in Setswana. The *Tshepo* study is conducted at Princess Marina Hospital which caters for residents of Gaborone and the surrounding villages. The objectives of the study are to assess the emergence of drug resistance to Highly Active

Anti-retroviral Therapy (HAART) and to identify strategies that can promote drug adherence. The respondents in the study were randomly allocated to one of the six (HAART) regimes and randomised to one of two adherence strategies: the standard of care (SOC) or community- or family-based daily directly observed therapy (Com-DOT). The study aims at:

- Comparing the times respondents on different treatment regimes developed side effects to the HAART.
- Determining the adherence rate of respondents to the SOC and Com-DOT strategy.
- Comparing the outcomes of participants who started ARV with a CD4 cell count of below 200 and those with a CD4 cell count of 350 and above.
- Comparing productivity and quality of life of respondents on different treatment and adherence strategies.

The programme also assists the Debswana mining company with the implementation of antiretroviral programme for the employees (Thior 2004:3). This study was conducted to identify whether there were differences in the level of knowledge between the women enrolled in the PMTCT Harvard programme and those who were not enrolled.

2.3.3 Baylor support programme

Baylor is a technical support programme from Bristol-Meyers Squibb. The Baylor International Paediatric AIDS Initiative programme coordinates a nurse education and physician exchange programme between Botswana, Lesotho, Namibia, South Africa and Swaziland, and the USA. Baylor, in collaboration with the Government of Botswana built a Paediatric Clinical Centre of Excellence to provide paediatric care to HIV/AIDS-infected children. The programme monitors the health and treatment of HIV-positive children from 6 weeks to 13 years of age. The children under 1 year who are HIV positive are given antiretroviral therapy. The children over 1 year are put on antiretroviral therapy in the presence of AIDS defining illnesses and where there is a CD4 cell count less than 25% of the normal range. Their health is monitored every 3 months; the monitoring includes growth and development, CD4 cell counts and viral load, full blood count, and liver function tests every 3 or 6 months. The children are

assessed until 13 years of age when they are referred to the adult Communicable Disease Control (CDC) programme. The programme provides support, learning material, mentor and training of health workers on HIV/ AIDS (Masupu et al 2003:21; Thior, Baxter, Wester 2004:1). The PMTCT, HARVARD and BAYLOR programmes aim at reducing the pool of adults infected with HIV and transmission of HIV from mother to child through breast-feeding.

2.4 KNOWLEDGE OF WOMEN ATTENDING ANTENATAL CLINICS ON MTCT

2.4.1 Transmission of HIV from mother to child

Baggley et al (2002:117) state that not all babies born from HIV-positive mothers are infected, as transmission occurs when the baby is in contact with body fluids like during delivery and through breast-feeding. The chances of MTCT of HIV are estimated to be 40% in the absence of preventive measures (Baggley et al 2002:117).

A study conducted at two Kenyan clinics and six Zambian clinics by Rutenberg et al (2003c:3-4) found that the rate of HIV transmission during pregnancy ranged from 5 to 10%, during labour and delivery 10 to 20%, and while breast-feeding 10 to 20%.

2.4.2 Breast-feeding

Essex, Mboup, Kanki, Marlink and Tlou (2002:561) confirm that breast milk is the best to nourish infants and protect them from illnesses such as ear infections, diarrhoea, rashes, and allergies. Breast-fed infants have lower rates of hospital admissions and other medical problems than formula-fed babies do. However, in HIV-positive women, breast-feeding is responsible for a third to a half of the HIV transmission. Bhat and Bunn (2003:2) rate the risk of MTCT HIV transmission from mother to child to range between 7-14% and 18-25%.

Table 2.1 Age and risk of HIV transmission in breast-feeding

AGE IN MONTHS	RISK PERCENTAGE
1-5 months	0.7%
6-11 months	0.6%
12-17 months	0.3%
18-23 months	0.2%

Adapted from Essex et al (2002:560-561, 563)

According to the table above, Essex et al (2002:560-561, 563) found that the risk of HIV transmission was found to be high in the first weeks of life (0.7%).

According to Newell (2004:1,11,13), the risk of HIV transmission through breast-feeding is high among mothers who are recently infected due to high levels of viral load and low white blood cell count. Prolonged breast-feeding also increases the risk of HIV transmission. Lang (1997:3) states that babies born from HIV-positive mothers stand a 15% chance of being infected during breast-feeding, hence the recommendations from the WHO, IAS and UN that all HIV-positive mothers should avoid breast-feeding and use formula replacement feeding. Lang (1997:3) therefore recommends the use of home-prepared fresh or processed cow's or goat's milk diluted with water accordingly.

2.4.3 Factors associated with HIV transmission in breast-feeding

Lewis (2001:5) states that the individual's knowledge of MTCT of HIV influences their decisions on the infant feeding method and may put the child's life at risk of HIV infection. According to the AIDS Helpline (2004:11), prolonged breast-feeding, longer than 12 months is associated with an increased risk of HIV/AIDS transmission of 14% to 15%. Mixed feeding for 6 months is associated with a 5% risk. The other factors are a high viral load; poor attachment to the breast, oral infant pathologies like oral thrush and immature immunity status of the infant (AIDS Helpline 2004:11). This means that avoidance of breast-feeding in these conditions may reduce the risk of HIV transmission.

Aspects that influence transmission of HIV during breast-feeding include:

- (a) High maternal viral load: In Durban, South Africa and in Malawi, Van der Horst, Kazembe, Duerr, Piwoz, Fiscus, Ahmed, Shugaras, Kashuba, Bentley, Adair, Cornelli, Cross, Cohen, Hoffman, Jones, Moses, Martinson, Heilig, Kourts, Thomas, Hurst, Bayer, Guay, Barry, Ryan and Merry (2002:13) found HIV ribonucleic acid (RNA) in breast milk. This substance is found in the nucleus of living cells including HIV and in breast milk. The presence of this RNA in breast milk increased the risk of HIV transmission five-fold. The level of HIV in breast milk was found increased in mastitis, which was associated with increased risk of HIV transmission. The risk of HIV transmission was also found to be high in the acute stage (recent infection) of AIDS or advanced stage where the CD4 cell count is low.
- (b) Breast conditions: The following breast conditions are associated with an increased risk of HIV transmission: inflamed breasts during clinical mastitis, sub-clinical mastitis or breast abscess, cracked nipples, fissures, sores on the breast and bleeding from the nipples. Therefore, women are advised to identify fissures, cracks on the breast, breast abscess and mastitis that may be a mode of entry of HIV to the baby and avoid breast-feeding during these conditions (Coovadia & Coutsoodis 2001:7; Essex et al 2002:564). According to Coovadia and Coutsoodis (2001:7), babies born from HIV-positive mothers can also get HIV from the breast milk itself, as studies have confirmed the presence of HIV in breast milk with high concentration in the colostrum.
- (c) Integrity of infant mucous membrane: Conditions that damage the gastrointestinal tract like oral thrush may be associated with increased risk of HIV transmission. This may result from feeding with cow's milk, allergic reactions to complementary feeds and other oral infection (Newell 2004:15).
- (d) Sex of infant: According to Newell (2004:15), male infants who were breast-fed on HIV-positive mothers with a CD4 cell count of less than 200 mm³ had a 60% chance of being infected while their female counterparts had a 40% risk of being infected.
- (e) Premature infants: Premature infants are at high risk of HIV transmission due to an immature immune system, which cannot easily fight infections. In addition, the premature skin can easily be damaged during breast-feeding and allow HIV to enter the baby's blood stream (Newell 2004:15).

- (f) Mode of delivery: According to Anderson (1999:1) and Essex et al (2002:254), deliveries by caesarean section reduce the risk of HIV transmission during birth. Baggley et al (2002:118) state that the placenta acts like a barrier that prevents HIV and other infective organisms from gaining access to the uterus. Anderson (1999:1) states that three studies done on 902 women on AZT in the American College of Obstetricians and Gynaecologists comparing the modes of delivery and HIV transmission to infants found that babies delivered by elective caesarean section had a reduced rate of HIV infection compared to those where antiretroviral drugs were used in isolation. Furthermore, caesarean section done before onset of labour or rupture of membranes does not allow micro-transfusion of blood from mother to foetus (normally about 3ccs). The HIV-transmission risk rate to different types of deliveries was as follows: elective caesarean section 0.8%, emergency caesarean section 11.4% and vaginal delivery 6%. “Three (1.8%) out of 170 infants born to women assigned caesarean section delivery were infected compared to 21 (10.5%) of 200 infants born to women assigned vaginal delivery” (Anderson 1999:1). However, there was a combination of the antiretroviral drug, AZT, and caesarean section delivery.

In a study on non-instrumental and instrumental deliveries in five (5) European and 10 North America hospitals of 8 533 women, Kirchner (1999:1-2) also found that the HIV transmission rate was lower in elective caesarean sections (2%) while vaginal delivery through vacuum extraction had an HIV-transmission rate of 7%. The use of invasive procedures like episiotomies, early rupture of membranes, external cephalic inversion, foetal scalp electrodes allow the baby to be in contact with body fluids and blood which may lead to HIV transmission.

In Botswana, Lewis (2001:1, 3) found an increased number of caesarean sections in PMTCT sentinel sites although these were not voluntarily chosen or done to prevent MTCT. The Botswana government hospitals currently do not perform caesarean section as a means of reducing HIV transmission due to resource constraints except at Gaborone Private Hospital. At Gaborone Private Hospital, HIV positive pregnant women can freely choose caesarean section mode of delivery in the absence of other obstetric indications to reduce MTCT of HIV. Therefore, where the medical resources and personnel are available, HIV-positive mothers should be informed about the risk of

HIV transmission during normal vaginal delivery and be allowed to choose surgical delivery to prevent MTCT of HIV. Invasive procedures such as manual rupture of membranes, episiotomies, and external cephalic inversion should also be avoided when possible.

- (g) Mode of infant feeding: A study in Kenya by Horizons (Rutenberg et al 2003 b:3) indicated that exclusive formula milk feeding reduces HIV transmission by 44%. These findings suggest that if exclusive formula milk feeding were used, HIV transmission would be reduced by almost half. However, in developing countries both breast-fed and formula fed infants have a similar death rate at 2 years (20%) due to poor sanitation, which may lead to diarrhoeal diseases and malnutrition. Hence AIDS Helpline (2004:21, 38) cautions that the UN suggests the use of exclusive breast-feeding unless the feasible, accessible, satisfactory sanitary (FASS) criteria are met for formula milk feeding.

In Malawi, Miotti, Paola, Taha, Kumwenda, Broadhead, Mtimavalye, Hoeven, Chipangwi, Liomba, and Biggar (1999:744) found that 47% of 672 children were infected through breast-feeding. The cumulative risk of HIV infection was 3.5% at 1 month, 7% after 5 months, and 10.3% after 23 months. The risk of HIV transmission was found to increase with age and duration the child was breast-feeding.

2.5 FACTORS THAT INFLUENCE CHOICE OF INFANT FEEDING METHOD

There are several factors that influence the mother's choice of infant feeding methods, these include mode of infant feeding method, education, culture, socio-economic status, health services status, stigma, discrimination and ethical issues.

2.5.1 Education

The Botswana literacy rate for people 15 years and older who can read and write is 79.8% for the total population; 76.9% for males, 82.4% for females (*FACT Botswana* 2002:2). NACA and CSO (2004:51) found that 69% of the population interviewed could read English and Setswana with ease, 20% had difficulty and 12% were unable to read and understand.

The high literacy rate may mean that people can read and understand health information including health-related issues on transmission of HIV infection from mother to child. However, Masupu et al (2003:16) found no relationship between level of education and HIV prevalence among pregnant women. Thus, out of a sample of 6 377 HIV-positive women, 515 (36.3%) had no education; 1 604 (42.8%) had primary education; 4 042 (38.0%) had secondary and 216 (20.8%) had tertiary education. In Ngamiland, Botswana, the Agency for Co-operation and Research in Development (ACORD) found that people were generally aware of HIV, but that 50% could not differentiate between HIV infection and AIDS. Of the respondents, 96% did not know their HIV status and were not ready to test for fear of psychological effects if they tested positive; 78% knew about MTCT of HIV. There was an association between education and the use of preventive measures, thus 60% of those who had not gone to school or with primary education did not use condoms compared to 52% with a higher education level (ACORD 2002:6, 22, 27).

In Botswana Lewis (2001:5) found that mothers had poor knowledge of the preparation of formula milk due to inadequate counselling and demonstration by health workers. The majority of mothers were using bottles instead of cups and spoons to feed their babies when using formula milk, which put the children at risk of diarrhoeal diseases. Thus, the level of education may be associated with a better understanding of health information and good practices in health care.

2.5.2 Socio-cultural factors

Breast-feeding practices are influenced by the cultural norms enforced by older women in the community. Therefore, programmes should provide “acceptable, feasible, safe, and affordable feeding recommendations that do not erode strong cultural practices” (Rutenberg 2003c:1). In a study in Mochudi, Botswana, Linchwe (1994:1-2) found that, unlike the younger mothers, older women did not mind to breast-feed in public. The study also found that the extended family system did not function properly in most families due to people working far from home and high economic demands on families; people tended to care more about their immediate family members; modesty and the need for privacy. Thus due to weak family ties and poor interaction, the aunties and

grannies did not actively pass on the norms and values of breast-feeding practices to the new generation.

Moagwe (1995:42) found that breast-feeding practices were badly affected by formula consumerism, threatening the free and readily available breast milk. The free provision of formula milk in hospitals and health facilities and attractive advertisements by dealers persuaded women to consider formula milk feeding as better. Moreover, the support system of husband and wife influenced the mother's decision on breast-feeding. Based on these findings, it is important to disseminate culturally sensitive information, as breast-feeding is still the best option for HIV-negative mothers. In Molepolole, Botswana, Shapiro et al (2005:10) found a low adherence of mothers to the chosen infant feeding method due to the cultural norms, which encouraged mixed feeding. Bhat and Bunn (2003:2) and Lewis (2001:5) found that mothers who had disclosed their HIV status to their partners got support and adhered to their initial infant feeding method of choice. Thus, the choice of infant feeding method may be influenced by acceptable behaviour in society. Therefore, advice to HIV-positive women should be based on local conditions that are acceptable to the community.

In Bontleng, Botswana, Tlou et al (2000:39) found that women's decision to participate in PMTCT was influenced by spouses, members of the family and the community. Therefore, all HIV-positive women should be encouraged to share the HIV results with their sex partners or significant others. The choice of infant feeding method may also be influenced by the availability of resources and finances to purchase infant feeding formula, refrigerators for storage, water energy to boil the water for preparing formula milk, gender inequality, stigma and discrimination.

2.5.3 Socio-economic factors

Latham and Preble (2000:1657) state that the choice of infant feeding method is influenced by the economic conditions of the individual, the family and the country. Furthermore, although formula milk feeding is feasible in developed countries, it may not be feasible and affordable in poor, developing countries. The use of this type of feeding method in households with poor sanitation; unsafe or scarce water resources; no refrigerators and inadequate health services may lead to diarrhoeal diseases and

malnutrition which is the leading cause of infant morbidity and mortality in these countries. Rosser (2000:12) state that although commercial infant formula milk provides the necessary nutrients for babies unable to breast-feed, it is expensive and requires other resources. For example, the preparation of formula milk requires energy for boiling water, sterilization of equipment, safe water supply and safe sanitation that may not be adequately met by the mother.

A study done in South Africa at three pilot areas at Paarl (Western Cape), Rietvlei (Eastern Cape) and Umlazi (KwaZulu-Natal) by Doherty, Chopra, Nkonki, Jackson and Greiner (2006:93) found that mothers who had chosen formula milk replacement feeding ran out of formula milk supplies before the next visit and were scared to go back to the clinic for more supplies so they either had to buy or do without it. The poverty levels in Botswana are 11.7% for urban areas and 27.1% for rural areas (NACA & CSO 2004:45). Poverty may lead people to choose inappropriate infant feeding methods. It is estimated that from birth to 6 months a child requires 40 x 500g packets/tins of formula milk at P22.00 per packet/tin, which amounts to P880.00. In Botswana, the industrial class worker minimum wage per month is P500.00. This may mean that the mother may not be able to afford basic needs like fuel, water and sterilization equipment when the baby is on formula milk. However, mothers registered on the PMTCT programme in Botswana are provided with free formula milk for one year, which means that the mothers do not need to buy the milk supplies. This makes it cheaper for the family, but costly for the government.

2.5.4 Health service-related factors

Due to the risk of HIV transmission through breast-feeding, health services should try to provide safe, feasible and affordable recommendations that offer protection and do not invade the cultural breast-feeding practices. In Kenya and Zambia, Rutenberg et al (2003b:7, 13, 18) found that counselling is important to reduce MTCT of HIV as it provides relevant information to mothers on the appropriate choice of infant feeding method. Rutenberg et al (2003a:18) noted that nurses, midwives, counsellors and nutritionists who provided counselling on infant feeding methods in these countries had poor knowledge. However, good counselling can help HIV-positive mothers to select safe infant feeding methods. In Botswana, Burundi, Cote d'Ivoire, Honduras, Rwanda,

Tanzania, Uganda, Zambia and Zimbabwe, out of 388 705 women counselled on HIV, many who tested for HIV did not come for their results. For example, the following response rates were recorded after pre-test counselling from January to June 2002: Botswana 52%, Honduras 79.8%, Rwanda 83.3%, and Tanzania, 80.8% (Rutenberg et al 2003a:17-18).

2.5.5 Stigma and discrimination

According to Pratt (1995:176), Long and Ankrah (1996:227) and Tabi and Frimpong (2003:245), society regards motherhood, child-bearing and child rearing as a woman's obligation or essential responsibility and major role. Few women are willing to forego child bearing even in the knowledge of being HIV positive. Some women who become pregnant may not be able to avoid HIV exposure. For example, male partners very often do not know their HIV status; women are raped, or coerced into marital and non-marital sex, including commercial sex. In some cultures, women are subordinates in the sexual relationship; they have little or no say in the way sex is conducted. In addition, most women depend on their male partners for financial support and live in fear of being abandoned. This puts them at risk of sexually transmitted infections (STIs), including HIV. New parents want to give their babies the best and the best first food for a baby is breast milk as it contains all the nutrients and protects infants from respiratory and other diseases. However, in most societies HIV is viewed with stigma and great secrecy due to the stigma attached to the diagnosis. The fear of stigma is so severe that HIV-positive partners find it difficult to disclose their HIV status for fear of discrimination or accusations of bringing HIV into the family, being ridiculed or ostracized. According to Limson (2001:1), family members or the community may treat the individuals affected by HIV with the perception that they were promiscuous and then socially isolate them. Therefore, individuals diagnosed with HIV infection keep it a secret. Above all, people in the rural areas expect mothers to breast-feed their children and the decision not to breast-feed could easily defeat the secretive coping strategy.

In Zambia Rutenberg (2003b:26) found that the number of mothers who disclosed their HIV status after an education programme increased from 55% to 74.9% within 18 months. In addition, those who disclosed their HIV status got support and encouragement from their partners or significant others on the method of infant feeding

chosen (Rutenberg et al 2003b:26). In a study in Khayelitsha, South Africa, Chopra, Piwoz, Sengwana, Schaay Dunnett and Sanders (2002:301, 304) found that some HIV-positive mothers reported no discrimination due to not breast-feeding but found it difficult to explain the reasons for not breast-feeding when asked by friends or relatives. Out of 11 mothers, 8 disclosed their HIV status and got support from their family members. In a study on pregnant Chinese women in Hong Kong, Ho and Loke (2003:238) found that 70% of suspected HIV cases had the HIV screening test together with their spouses. This indicated a more accepting culture to HIV. Lewis (2001:3) found that some mothers abandoned formula milk supplies in the clinics and some of those enrolled in the PMTCT programme preferred to purchase formula milk from a pharmacy or shops for fear of stigma and discrimination. Therefore, Lewis (2001:5) recommends the improvement of the logistics of formula milk distribution to ensure privacy and confidentiality and to prevent stigma and discrimination. Willumsen and Rollins (2001:32) found that 16% of the mothers bought milk from a pharmacy or shops for fear of being seen carrying formula milk from the clinic. In addition, 20% of the mothers who had chosen formula replacement feeding method admitted putting their babies to the breast in public places for fear of stigma and discrimination. Based on these findings HIV-positive mothers may opt to breast-feed their babies despite being aware of the risk.

Another study done in South Africa at three pilot areas at Paarl (Western Cape), Rietvlei (Eastern Cape), Umlazi (KwaZulu-Natal) on 650 HIV positive mothers found that mothers who had chosen formula replacement feeding had to give excuses to relatives for not breast feeding and had feelings of powerlessness, social isolation because of the stigma attached to formula milk feeding (Doherty et al 2006:93).

Rutenberg et al (2003c:25) found that the integration of PMTCT programme in the maternal and child health programme was not associated with stigma and discrimination by both the service providers and the clients. Lewis (2001:5) found that, 78% of the mothers had disclosed their HIV status to the fathers of the child or their own mother and got social support. Bhat and Bunn (2003:2) also found that mothers with supportive partners adhered to their initial choice of child feeding method.

Long and Ankrah (1996:227) and Tabi and Frimpong (2003:245) state that some mothers do not know their HIV status because they are afraid to be tested, lack accessibility to voluntary counselling and testing centres, and fear stigma and discrimination if they test positive. It will take time to change the beliefs and values of people about MTCT of HIV. However, measures must be put in place to prevent discrimination against those who test positive. Tabi and Frimpong (2003:245) point out that it took a long time to teach people the importance of breast milk and it will also take time to change people's beliefs and attitudes about the importance of formula milk feeding for HIV-positive women. However, it is difficult for women who do not know their HIV status to make an informed choice on the appropriate method of infant feeding.

2.6 HEALTH WORKERS' ETHICAL AND LEGAL RESPONSIBILITIES

Health workers ethical and legal responsibilities are important when counselling women on infant feeding methods, as these may influence an appropriate choice.

2.6.1 Ethical responsibilities

According to Long and Ankrah (1996:227), research protocols to compare HIV transmission between formula feeding and breast-feeding raise ethical questions and problems. The use of formula milk feeding is not feasible in developing countries as individuals and governments in these areas cannot afford to buy formula milk. These countries or individuals may also have scarce resources, such as safe water supply, poor sanitation, energy and refrigerators. However, HIV-positive women should be given the necessary information and encouraged to make an informed decision based on the realities of their situations. To make an informed choice means that women who want to be pregnant need to be aware of the risk of getting infected if the partner is HIV positive or does not know his HIV status, and have a better understanding of HIV transmission through breast-feeding as well as the use of appropriate infant feeding method. Consequently, there is a need to disseminate client-sensitive information, which does not offend or impose guilt feelings on the mothers (Long & Ankrah 1996:227). Thus, encouraging HIV-positive women to breast-feed increases the risk of HIV transmission and violates the rights of the child and mother to informed choice. Encouraging HIV-positive women to breast-feed may put babies' lives at risk of HIV

transmission. At King Edward VIII Hospital, Durban, a study on 13 HIV-positive mothers found that the mothers were not given adequate information on HIV-transmission through breast-feeding, which then led to a wrong choice of child feeding method (Seidel, Sewpaul & Dano 2000:1). Some mothers who had chosen breast-feeding could not easily formula feed because of pressure from relatives to breast-feed or for fear of being laughed at or physically abused by close relatives. Therefore, all HIV-positive pregnant women should be counselled on child feeding methods and be allowed to choose a method based on the realities of their life situation, and be supported by health personnel on their choice. A study on 108 HIV-positive mothers in Cameroon by Muko, Tchangwe, Ngwa and Njoya (2004:137) found that 84% chose breast-feeding and out of 17 single mothers, 82% chose breast-feeding due to strong influence of social support system. Only 16% chose formula milk feeding. The choice of breast-feeding was due mainly to the fear of stigma and discrimination rather than the cost of formula milk.

2.6.2 Principles to guide infant nutrition

When health workers counsel individuals on infant feeding methods, they have to consider the rights of children to breast-feeding, and HIV/AIDS. According to Kent (1999:1), the following principles must guide infants' nutrition:

- Children have the right to be kept free from hunger and enjoy good standards of health care, and be breast-fed when their parents choose to do so. Children are also entitled to an assurance that parents are informed, educated and supported in the use of basic knowledge of child health and nutrition. Even in the presence of HIV/AIDS, mothers or parents must be made aware of alternative feeding options and be allowed to make an informed decision. Nevertheless, the persistence of HIV-positive mothers to breast-feed their children and the denial that HIV can be transmitted through breast-feeding may pose a threat to the child, who is unable to make an informed decision. Therefore, the health worker has to be an advocate for the child who cannot make an informed decision as well as respect the mother's or the parents' decision as they are the child's legal guardians and have the right to raise their child, as they want. This becomes a legal and ethical issue as the mother could sue the health care system if the

health worker withholds information, as the major factor that influences people's decision to prevent an illness or infection is their knowledge. The health worker who withholds information violates the mother's rights to informed choice.

2.7 STRATEGIES TO PREVENT HIV TRANSMISSION TO INFANTS

Tabi and Frimpong (2003:243) points out that between 1990 and 1995 UNICEF and the WHO advocated breast-feeding as a means of providing adequate nutrition and antibodies to the baby to reduce infant mortality rate. Maternity units, hospitals and clinics stressed the advantages of exclusive breast-feeding and benefits of breast-feeding. Hospitals developed policies on the promotion of breast-feeding and awards and prizes were given to baby-friendly hospitals worldwide. However, with the HIV/AIDS pandemic health workers find themselves cautioning HIV-positive mothers against breast-feeding. Furthermore, people in rural areas expect mothers to breast-feed their children and any actions contradicting breast-feeding are looked upon with suspicion, especially now that there is a relationship between breast-feeding and HIV-positive status. Therefore, there is a need to disseminate culturally sensitive information about HIV transmission through breast-feeding. The knowledge of various modes of MTCT of HIV may help the mothers to protect their children from HIV infection. Although breast milk is readily available and breast-feeding mothers are respected by society, a few viruses can pass through breast milk including HIV.

In Kenya, Coovadia and Coutsooudis (2001:1) found that the risk of HIV transmission was reduced to between 40 and 44% if the children were formula fed with access to clean water, although the mortality rate was the same with the breast-fed children at 24 months due to diarrhoea diseases and malnutrition. These findings suggest that the use of formula milk feeding could reduce HIV transmission by almost half in countries with access to clean water, good sanitation and in situations where the parents can afford it. However, in developing countries without good sanitation, safe water supply and where individuals cannot afford formula milk and other resources, formula milk feeding is more risky than breast-feeding. Formula milk is expensive and requires other resources for safer preparation and storage. Lack of these resources may lead to diarrhoea and malnutrition, which is the main cause of increased infant morbidity and mortality in developing countries (Coovadia & Coutsooudis 2001:1, 3). In addition, use of anti-

retroviral drugs to reduce the viral load in the mother and reasonable clinical practices may be used to reduce MTCT during breast-feeding. Other strategies are avoidance of the baby being in contact with blood or body fluids during delivery, avoidance of invasive procedures like external cephalic version, artificial rupture of membranes, episiotomies, vacuum extraction and forceps delivery (Coovadia & Coutsooudis 2001:7). Service providers should follow infant feeding guidelines to counsel the mothers on appropriate method of infant feeding.

2.7.1 PMTCT infant feeding guidelines

The Botswana feeding guidelines encourage all pregnant women to test for HIV early in pregnancy. The guidelines further state that pregnant women who did not test for HIV during pregnancy should be encouraged to do so post-natally in order to choose an appropriate infant feeding method. All HIV-positive mothers should be counselled on infant feeding options and be supported in their choice. The national guidelines state that where replacement formula feeding is feasible, accessible, affordable, sustainable and safe (FASS), HIV-positive mothers should avoid breast-feeding. However, in countries where individuals cannot afford formula milk feeding and FASS criteria are not possible, HIV-positive mothers are advised to exclusively breast-feed for the first few months with abrupt cessation as soon as a safe, affordable, accessible, sustainable alternative is found. HIV-negative women and those who do not know their HIV status should be encouraged to exclusively breast-feed for 3 to 6 months and complementary formula feeding for at least two years (AIDS Helpline 2004:21, 38). Other methods of infant feeding are heat-treated breast milk; wet-nursing by HIV-negative mothers, commercial formula milk or home modified animal milk.

According to Baggley et al (2002:77-78) and Jimenez, Martin, Ross, Henderson and McNulty (2004:6), the Botswana government feeding recommendations are in line with the WHO recommendations for different groups of mothers:

- HIV-negative mothers: HIV-negative mothers should exclusively breast-feed for 6 months and continue with complementary breast-feeding for up to 24 months or more.

- HIV-positive mothers: HIV-positive mothers are encouraged to use formula milk for one year with complementary food supplements introduced at 3 to 6 months. Free formula milk is supplied for one year to all HIV-positive mothers who have joined the PMTCT programme. HIV-positive mothers who choose to breast-feed are advised to exclusively breast-feed for 3 to 6 months with abrupt cessation and introduction of formula milk for one year or more and introduction of supplementary foods at 3 to 6 months. The mothers who choose this method are provided with free formula milk for one year.
- Unknown HIV status mothers: Mothers of unknown HIV status are encouraged to test for HIV any time during their pregnancy or soon after delivery. If still not voluntarily tested for HIV, they are encouraged to exclusively breast-feed for 6 months and continue complementary breast-feeding up to 24 months or more. They can also choose to exclusively breast-feed for a period of 3 to 6 months with abrupt cessation. Formula replacement milk feeding and supplementary feeds are introduced after 4 to 6 months and continued until the child joins the family meals.

A survey by NACA and CSO (2004:49) found that the main source of energy in Botswana is gas: 47% of the households use gas; 41.6% use wood/charcoal; 6.1% use electricity; 4.8% use paraffin, 0.2% use solar heating, and 0.3% use coal. The survey also found that over 90% of the people in Botswana have access to safe drinking water as follows: 100% in towns, 99.5% in cities, 99.2% in urban villages, and 79.9% have safe sanitation for excreta disposal, which reduces the risk of diarrhoea in formula feeding (NACA & CSO 2004:49).

2.7.2 Breast-feeding practices

Breast-feeding provides 100% nutrition for a baby in the first 6 months, 50% for 6 to 12 months and 33% in the second year of life (Baggley et al 2002:81). Van der Horst et al (2002:14) state that breast milk provides for over 50% of nutrition to children under the age of 6 months and is difficult to replace in developing countries. Moreover, infants who do not breast-feed have an increased risk of dying within the first year of life due to lowered immunity against common childhood illnesses, like diarrhoea and malnutrition. The death rate was high in the earliest months of life and decreased as follows: 5.8% at

0-1 month, 4.1% at 2-3 months, 2.5% at 4-5 months, 1.8% at 6-8 months, and 1.4% at 9-11 months. Hence, the WHO recommendation to exclusively breast-feed in the first 6 months with abrupt cessation at 6 months and introduction of complementary feeds. In addition, Coovadia and Coutsoodis (2001:1) state that in HIV-positive mothers, the risk of HIV transmission is 5% if breast-feeding is practised for 6 months.

2.7.3 Exclusive breast-feeding for 6 months or less

Exclusive breast-feeding, where no other foods or liquids are given, is safer than mixed feeding (Jimenez et al 2004:7; Long & Ankrah 1996:222). Other foods damage or irritate the gastro-intestinal mucus membrane and make it easier for the HIV virus to infect the baby. A study by Coovadia and Coutsoodis (2001:5) on 551 HIV-positive women who exclusively breast-fed for 6 months and 157 women who formula fed their babies, found that the rate of HIV transmission was higher in the mixed feeding group (26.1%) than in the exclusively breast-fed group (19.4%). Therefore, mixed feeding damages the bowel/gastro-intestinal tract and facilitates entry of HIV from breast milk into the blood stream (Coutsoodis, Pillary, Spooner, Kuhn & Coovadia 1999:4; Coovadia & Coutsoodis 2001:5).

A study between 1995 and 1998 at the King Edward VIII and McCord Hospitals in Durban, South Africa on 661 mothers on exclusive breast-feeding, mixed feeding and formula feeding, also found that the risk of HIV transmission at 3 months was high in the mixed fed children. The study found as follows on the different feeding methods: 14.6% (low) in exclusively breast-fed children; 24.1% (high) in mixed fed children, and 18% in never breast-fed group. Thus, exclusive breast-feeding for 3 to 6 months carries a lower risk of HIV than mixed feeding (Coutsoodis et al 1999:4). Long and Ankrah (1996:222) however, question whether women can realistically exclusively breast-feed. Mothers do not practise exclusive breast-feeding due to several factors like the cultural practice of giving traditional medicines and a belief that babies need water to quench the thirst. In their study on 500 women, De Paoli, Manongi, Helsing and Klepp (2001:313, 315, 318) found that only 54% of the mothers practised exclusive breast-feeding the first few days, and 46% could not exclusively breast-feed. The reasons for failure were to quench the baby's thirst, early return to work and young women's low perception of the breasts' attractiveness.

Between 1999 and 2000, Bland, Rollins, Slorash, Van den Broeck and Coovadia (2003:3-4) conducted a study at Hlabisa, Kwazulu Natal, on 149 women who kept a diary of exclusive breast-feeding at one clinic in the township with access to safe water supply and two clinics in rural areas fetching water from rivers and ponds. The study found that 46% out of 149 mothers practised mixed feeding. Out of those who exclusively breast-fed, 17% exclusively breast-fed for 2 weeks, 10% for 6 weeks, and 6% up to 16 weeks (Bland et al 2003:3-4, 6-7, 9).

In a parallel study at Mtubatuba, KwaZulu-Natal (1999-2000) on 130 mothers on exclusive breast-feeding, Bland et al (2003:779) found that mothers had a poor recall of exclusive breast-feeding 6 to 9 months post-delivery. Thus, 13% could not remember if they gave something other than breast milk at 13 weeks.

In Malawi, Van der Horst et al (2002:62) found that women could not exclusively breast-feed for 6 months because they wanted to quench the babies' thirst and believed that all humans needed water; solids and liquids were introduced at the median age of two months, and traditional medicine was given to help in the closure of the fontanel. Advice on abrupt cessation was not acceptable to poor women, as they could not afford to buy formula milk and were worried about what they would feed their children after cessation of breast-feeding (Van Der Horst et al 2002:62). In Zambia, Bhat and Bunn (2003:2) conducted a comparative study of 55 mothers aware of their HIV-positive status and 85 mothers not aware of their HIV-negative status. It was found that all the HIV-positive mothers chose breast-feeding, introduced fluids and complementary foods earlier, and were less likely to breast-feed for 2 to 3 months. In some areas in Zimbabwe exclusive breast-feeding was reported to increase from 20% to 50% after the introduction of education from September 1999 to January 2000 (Rutenberg 2003b:25). Abrupt introduction of formula milk feeds and abrupt cessation of breast milk is not without problems. In Kisumu, Kenya, Graham (1985) cited in Thomas, Armornkul, Mbori-Ngacha, De Cock, Slutker, Vulule, Otieno, Rosen, Ping Shi, Ambrose, Odondi, Oyoo, Marum, Van't Hoog, Fowler, Jamieson, Bulterys and Bell (2002:11, 20) found the following risks to abrupt breast-feeding cessation: dehydration, refusing to eat, weight loss, malnutrition, loss of bonding with mother, increased risk of neglect in the infant and stigma, breast, engorgement and mastitis to the mothers'.

According to Baggley et al (2002:81) and Newell (2004:17), exclusive breast-feeding is recommended for HIV-negative mothers, those who do not know their HIV status and those unable to use formula milk and want to eliminate the risk of HIV transmission through breast-feeding. Exclusive breast-feeding should be practised for 3 to 6 months followed by abrupt cessation and complementary feeds and may be continued for 2 years. However there is a need to support mothers as family members may criticize abrupt cessation, citing it as cruelty.

The Botswana PMTCT feeding guidelines also recommend that mothers who cannot overcome the family pressures of not breast-feeding should exclusively breast-feed for 3 to 6 months, as it is associated with low risk of HIV transmission (Baggley et al 2002:83). Exclusive breast-feeding may be difficult to practise due to demands at work which do not allow the mother time to breast-feed, distance from home to work and occasional social responsibilities that may separate the mother from child. The workplace has to be brought on board to provide spaces for breast-feeding, places to keep babies, store milk and support breast-feeding practices. Before the 1990s, most organizations or companies did not provide long breaks for breast-feeding working mothers to be able to go home to breast-feed during the day (Tabi & Frimpong 2003:243; Long & Ankrah 1996:222). However, the Botswana government policy determines that mothers are given 84 days' maternity leave and allowed to go and breast-feed for 1 hour if possible until the baby is 6 months old (Government of Botswana Document (GOBD): General Order 1996:83). Based on these findings, very few mothers can realistically practise exclusive breast-feeding due to lack of space at workplaces to express breast milk, store breast milk and feed the babies. Health workers must support mothers who choose to exclusively breast-feed by teaching them to express breast milk and how to store it.

2.7.4 Mixed feeding (breast + formula) avoidance

Most mothers do not easily adhere to exclusive breast-feeding. In Kenya and Zambia Nduati, John, Mbori-Ngacha, Richardson, Overbaugh, Mwatha, Ndinya-Achola, Onyango, Hughes and Kreiss (2000:1167) found that a third of the mothers had introduced other feeds by 6 months, 40% of HIV-positive women practised mixed feeding by 3 months and 90% by 6 months. Rutenberg et al (2003b:33-34) found HIV-

positive women's choice of infant feeding methods was as follows: 3% exclusive breast-feeding, 87% exclusive formula feeding and 10% mixed feeding. The small percentage of women practising exclusive breast-feeding could have been due to the provision of free formula milk supply or lack of knowledge on the advantages of exclusive breast-feeding.

2.7.5 Colostrum expression

Long and Ankrah (1996:22) and Biancuzzo (1999:352) state that colostrum is rich in proteins and large quantities of the HI viruses hence the recommendation to discard it for the first few days to reduce the risk of HIV transmission.

2.7.6 Breast milk treatment to inactivate HIV

According to Jimenez et al (2004:8), breast milk is a living fluid, which contains antibacterial, antiviral, anti-infective, anti-parasitic substances, hormones, enzymes and immunological factors that reduce infant morbidity and mortality rate. It protects the babies from infection, promotes physical and neurological development, and reduces childhood cancers, like Hodgkin's disease and lymphoma, and the mortality rate among pre-term babies. In addition, breast milk contains correct amounts of proteins and fatty acids and can easily be digested. Breast milk is also cheaper and breast-feeding mothers are respected by society. Breast milk is always sterile, never contaminated by polluted water or dirty utensils, which can also lead to diarrhoea in the infant. However, in HIV-infected mothers a few viruses can pass through breast milk to infect the baby.

According to Coovadia and Coutsooudis (2001:7), breast milk can be heat treated to inactivate the HIV in it by placing a jar of expressed milk in a pot of boiling water at a temperature of 62.5 degrees Celsius for 30 minutes to destroy the HIV. The pot and jar are then removed from the heat and left to cool for 60 minutes. The heat reduces the amount of HIV virus in the breast-milk and the milk could be used in breast conditions like bleeding nipples, mastitis, breast abscess or candidiasis while the mother is receiving treatment.

2.7.7 Alternative breast milk sources (wet nursing)

Long and Ankrah (1996:22) and Jimenez et al (2004:8) describe alternative breast milk sources or wet nursing as when another woman rather than the mother of the child breast-feeds or provides breast milk. This is based on the assumption that the woman has tested HIV negative and will not become infected with HIV for as long as she is providing breast milk. The alternative breast-feeding woman should be educated to ensure that she remains negative throughout the breast-feeding period and practises safe sex. The alternative breast-feeding woman should prevent and treat early cracked, bleeding nipples, mastitis, abscess or candidiasis as she can also be infected from an HIV-positive baby (Jimenez et al 2004:8).

In Kenya, Oguta, Omwega and Sehemu (2001:84) found that grandmothers practised wet nursing on orphaned children but the practice was not readily accepted by middle aged women due to the cultural cleansing practices. In this community, a sexually active wet-nursing woman and the child were supposed to take certain traditional medicines and bath to cleanse them before breast-feeding the child after sexual contact with their spouse to prevent the child from becoming ill or dying from lack of respecting traditional beliefs (known as *Chira*). Wet nursing ensures that babies get the nutrition and antibodies required for growth and development. According to IRIN (2003:1), another way of providing breast milk to babies is to use breast milk banks. The use of breast milk banks is practised in KwaZulu-Natal, South Africa, by an organization known as *IthembaLethu*, which means “our hope” in Zulu. In this project, orphaned or abandoned HIV/AIDS malnourished or neglected children are provided with donated breast-milk that boosts their immunity and nutrition status more than artificial formula milk. The HIV-negative volunteer mothers express breast milk that is then pasteurised or heat treated to eliminate any organisms, for example hepatitis and other viruses (IRIN 2003:1).

2.7.8 Formula replacement feeding

In many developed countries, HIV-positive women are advised not to breast-feed but to use formula milk. The WHO, IAS and UN recommend the prescription of formula milk to HIV-positive mothers in countries that can afford it (Altman 1998:1; Coovadia &

Coutsoudis 2001:7; Vargas 2003:1). Women in these regions have easy access to formula milk, clean water for mixing and washing, and refrigeration. While formula milk feeding may be the most obvious choice to prevent HIV transmission, it is still not easy and not affordable to use in developing countries. It is estimated that six times the children who are formula fed die from diarrhoeal diseases and malnutrition due to poor water supply, sanitation and hygiene and poor preparation of formula milk (Coovadia & Coutsooudis 2001:7). Lewis (2001:5) found that mothers had very poor knowledge of preparation of formula milk due to inadequate counselling and demonstration by health workers. In addition, the majority of mothers were using bottles to formula feed the children instead of cups and spoons.

Therefore, all HIV-positive women or parents must be provided with relevant information and be encouraged to make an informed decision on whether to formula or breast-feed their children. Formula milk replacement feeding in developing countries should only be commenced if the FASS criteria are met (Jimenez et al 2004:4, 5), namely.

- Feasible: The mother and family members should have the necessary knowledge and skills to prepare the feed and store formula milk. Health workers should ensure that the mothers are equipped with the necessary knowledge and skills in the preparation of formula milk and proper dilution of formula infant feeding milk to prevent diarrhoea diseases.
- Affordable: Health workers should establish that the parents can afford to purchase formula milk without compromising the nutrition of the family for two years or more.
- Acceptable: The choice of infant feeding should be done after consideration of the possible barriers, cultural, social, fears, stigma and discrimination. Thus, the infant feeding method should be culturally acceptable; otherwise, the mother may not be able to adhere to the chosen method.
- Sustainable: The family should be able to continuously provide the formula milk without interruption.
- Safe: Formula milk needs to be prepared in a safe and hygienic environment. Thus, the family should have access to clean water supply, toilets to prevent diarrhoea diseases, which may be a danger to the formula fed child.

2.7.9 Use of animal milk

When formula milk supplements are too expensive for the family, processed cow or goat's milk diluted with water can be used. Whichever method a woman chooses, it should be safe. Cow's milk has too much protein and salt for a baby's kidneys to process, and not enough calories. It can be modified for a 1-3 month old child by mixing 2 parts milk with 1 part clean water, sugar to taste and to increase the calories as dilution reduces the calories in it and then boiled (Jimenez et al 2004:9). Oguta et al (2001:80-81) found that the use of cow's milk was acceptable by 84.8% of the community, readily available but expensive for those who did not own cows. The use of cow's milk as a substitute for breast milk was accepted but the use of goat's milk was rare. In Zambia, Bhat and Bunn (2003:2) studied 55 mothers who were aware of their HIV-positive status and 85 mothers who were not aware of their HIV status, and found that the mothers who used cow's milk more as breast milk supplements did not modify it as recommended.

2.7.10 Use of antiretroviral drugs

According to Baggley et al (2002:176), the use of antiretroviral drugs during pregnancy and delivery slows down the viral replication and viral load in the mother, thereby reducing the risk of HIV transmission from mother to child. Coovadia and Coutsoodis (2001:7) also state that antiretroviral drugs reduce the viral load in the mother's breast milk and improve the mother's health. In Thailand it was found that a short course of AZT started at 36 weeks reduced HIV transmission by 50% in non breast-feeding mothers and the use of a single dose of Nevirapine reduced the risk to 47% (Rutenberg et al 2003b:3). In Rwanda, Ross (2003:1) found that a single dose of antiretroviral combination drugs at birth could reduce the risk of HIV transmission by half in breast-feeding mothers. However, the use of antiretroviral drugs is expensive to individuals and poor countries. The drugs were found to reduce MTCT when babies were exclusively breast-fed for 3 to 4 months but the chances of HIV transmission were increased in prolonged breast-feeding (Ross 2003:1). Therefore, the Rwanda study raises the possibility of a safer breast-feeding option for developing countries that cannot afford a combination of antiretroviral drugs, as a single dose drug is cheaper and may be affordable for these countries and individuals.

In Botswana, from January to June 2002, out of 62% pre-test counselled women in the PMTCT programme, 52% came for their results and 59.1% who were HIV positive received antiretroviral drugs (Rutenberg et al 2003b:15-21).

2.8 KNOWLEDGE OF SOURCES OF INFORMATION ON MTCT OF HIV

In Ngamiland, Botswana, information on HIV is spread by means of printed material like pamphlets, posters, and brochures. These materials are written mainly in Setswana and English, requiring literacy. Information is also disseminated on the radio and television although some communities have limited access to such facilities. Other sources of information were local clinics and Tebelopele testing centres (ACORD 2002:11). There are about 16 Tebelopele voluntary HIV testing centres and eight satellites throughout the country, which provide pre- and post-test counselling, as well as HIV blood tests. Most of these centres perform the rapid HIV test, which gives immediate results (*HIV AIDS in Botswana* 2005:1; Thior 2004:3). The National AIDS Coordinating Agency and Central statistics Office (NACA) found that 61% of information on HIV/AIDS was acquired from the radio and 39% from television/video (NACA & CSO 2004:64).

According to Dadian et al (2003:18), Rutenberg et al (2003a:18), in Zambia, mothers' knowledge of MTCT increased after the integration of PMTCT and voluntary counselling in the maternal and child health services. In the programme health talks on appropriate infant feeding methods for HIV-positive mothers in the antenatal clinic and pre- and post-test counselling were done on discharge from maternity units, at child growth monitoring clinics and in outreach programmes. The mothers were also given support in the chosen infant feeding method. At the end of the programme the mothers' belief that nothing could be done to prevent MTCT of HIV during pregnancy, delivery and breast-feeding declined from 31.8% to 3.9%. Dadian (2001:2) also reported that in Zambia and Kenya counselling provided information and support essential for the choice of infant feeding method. However, in Ndola clinics, Zambia it was found that only 15% of the respondents tested for HIV due to lack of tangible incentives like antiretroviral drugs and formula milk supply. This, then, indicates the importance of the provision of antiretroviral drugs and formula milk if the PMTCT programme is to succeed.

2.8.1 Measurement of knowledge

The Botswana literacy rate for people aged 15 years and older is 79.8% for the total population, 76.9% for males, and 82.4% for females (FACT Botswana 2002:2). The high literacy rate means that people can read health information, understand health-related issues including transmission of HIV infection from mother to child. Masupu et al (2002:16) found no relationship between the level of education and HIV prevalence among pregnant women. Out of 6 377 HIV-positive women of 15 to 49, 36.3% had no education; 42.8% had primary, 38.0% had secondary and 20.8% had tertiary education (Masupu et al 2003:16). Indicating that the increased level of education of the respondents may be associated with better understanding of health issues and preventive measures.

In Ngamiland, Botswana, ACORD (2002:6, 22, 27) provided baseline information on awareness of correct knowledge on HIV/AIDS. The study found that people were generally aware of HIV but of the respondents, 461 (50%) could not differentiate between HIV infection and AIDS; 443 (96%) did not know their HIV status and were not ready for testing for fear of psychological effects if they tested positive, and 719 (78%) knew about MTCT of HIV. There was an association between education and the use of preventive measures: 60% of the respondents who had no or primary education had a low condom use compared to 52% of those with higher education. Thus, a higher level of education was associated with a better understanding of health information and good practices. In their study, De Paoli, et al (2001:313, 315, 318) found that of 500 women, 90% were aware that HIV could be transmitted during pregnancy and breast-feeding; 66% believed that HIV could be transmitted through delivery, and 83% valued breast-feeding.

Oguta et al (2001:47, 88) found that out of 112 respondents, 8.9% had little knowledge of MTCT; 63.7% of the HIV-positive subgroup knew about MTCT and the knowledge of mothers on PMTCT influenced their choice of infant feeding method. Out of the 112 respondents, 110 (98.2%) breast-fed their infants due to low knowledge on transmission of HIV through breast-feeding, and mothers with knowledge of MTCT were more willing to consider other feeding alternatives.

According to Fekadu and Hussen (2004:56), individuals' levels of knowledge can be assessed using ordinal scales (e.g., excellent, very good, good, satisfactory, poor) or dichotomous "yes" or "no" questions. Oguta et al (2001:4) used a similar rating scale: No knowledge= 1 (0 points), Low MTCT knowledge = 2 (2-4points), Average MTCT knowledge = 3 (6-12 points) and High MTCT knowledge = 4 (10-12 points). However, Jack, Seloilwe, Mokoto, Letshabo, Veskov, Kobue, Bainame and Muzila (1999:41) measured knowledge, attitude and behavioural aspects of HIV/AIDS using open-ended and closed questions. Knowledge of individuals can also be assessed by using percentages of the number of people giving the correct responses to the questions.

2.9 HEALTH BELIEF MODEL (HBM) CONCEPTUAL FRAMEWORK

The conceptual framework chosen for the study was the Health Belief Model (HBM). According to Brown (1999:1), the HBM is widely accepted for change of behaviour and focuses on promotion and avoidance of negative states of health or illness. However, the other factors which may influence change of behaviour may include culture, community norms and gender power inequalities. The model uses the concepts of perceived susceptibility, perceived severity, and action effectiveness to prevent or mitigate threat, barriers to action.

- **Perceived susceptibility.** Perceived susceptibility is the individual's perception of the possibility of being affected by the disease (HIV/AIDS). This study investigated pregnant women's understanding of susceptibility of transmitting HIV to the child through breast-feeding.
- **Perceived severity.** Perceived severity is the individual's perception of the seriousness of the condition and its outcomes. The study elicited information on the perceived severity or intensity of the effects on the child.
- **Perceived benefits.** Perceived benefits refer to the individual's belief that taking a certain course of action will reduce the discomfort or disease. The study enquired whether taking a specific course of action, such as exclusive breast-feeding, would or could prevent HIV transmission.
- **Perceived barriers.** These are individuals' negative feelings that prevent them from taking an appropriate corrective course of action or change in behaviour. For instance, HIV-positive women might breast-feed their infants for fear of being

identified (stigma and discrimination) as HIV positive by using formula milk feeding associated with HIV-positive status.

- **Cues to action.** These are aspects that might lead individuals to certain behaviour. For example, information on MTCT from health professionals, radio and television may make an individual take appropriate action. Thus individuals are more likely to take appropriate action if they feel they could be affected by (susceptible to) the condition, and believe that the problem is serious enough to cause harm and that the course of action will reduce susceptibility.

Brown (1999) used the HBM in a study on condom usage. In that study, individuals who believed that they are at risk of contracting HIV/AIDS (susceptible) perceived the illness to have serious consequences (perceived severity) and that they had the capability to take appropriate action (cues for action) by using condoms. Individuals can take positive action on health issues if they feel that the health problem (HIV) can be avoided. In addition, individuals have to believe that by taking the recommended action, the negative effects of the condition (HIV) can be avoided. The individuals also have to believe that they can successfully take a recommended health action to avoid a negative health problem (Brown 1999:1). In this study, information was elicited from women attending antenatal clinics on the mode of HIV transmission from mother to child, perceived danger and risks that could influence the decision of women attending antenatal clinics on choice of infant feeding method, health promotion and preventive behaviour on HIV. The study also examined the antenatal women's knowledge of transmission of HIV through breast-feeding.

2.10 CONCLUSION

This chapter discussed the literature reviewed for the study on the knowledge of women on transmission of HIV through breast-feeding and other infant feeding methods, including the WHO and UN recommendations that HIV-positive women avoid breast-feeding and use formula milk replacement feeding. Chapter 3 describes the research design and methodology.