

ASSESSING THE HANDLING AND PROCESSING OF SPECIMEN IN
THE MEDICAL LABORATORY SERVICES IN TANZANIA

By

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I declare that **ASSESSING THE HANDLING AND PROCESSING OF SPECIMEN IN THE MEDICAL LABORATORY SERVICES IN TANZANIA** 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.

.....

SIGNATURE

(DR A KALOELLELA)

.....

DATE

Acknowledgements

This study assessed the handling and processing of specimen in the medical laboratory services in Tanzania. The study was conducted among the children who are most vulnerable to severe malaria infection.

I am grateful to God almighty for giving me life, health, strength and opportunity to complete this study. I adore and thank Him. I would like to acknowledge and give thanks to the following persons for their unending effort and encouragement showed to me during the study:

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**ASSESSING THE HANDLING AND PROCESSING OF SPECIMEN IN
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Abstract

Background

In Tanzania laboratory services were observed to be not providing the quality of services required. It is assumed that the perceived discrepancy between malaria diagnosis and confirming laboratory result might be attributed to incompetence of health personnel.

Objective

The objective of this research was to explore the competence and extend to which health personnel in Muhimbili hospital comply with procedural norms in malaria diagnosis.

Methodology

A quantitative approach of explorative descriptive design was used. A survey was done using observation guidelines based on existing policies and norms. Actual practice of malaria diagnosis compared with the policies and procedural norms.

Result

The data revealed that health personnel are not competence in malaria diagnosis.

Conclusion

Competence of health personnel is important in malaria diagnosis, a special guideline should be developed and in-service training be implemented to minimize errors in reporting for malaria investigation.

ASSEESING THE HANDLING AND PROCESSING OF SPECIMEN IN THE MEDICAL LABORATORY SERVICES IN TANZANIA

Key terms:

Medical laboratory services in Tanzania; Malaria disease profile; Health in care systems in Tanzania; Policy and procedure in medical laboratory service; Professionals in health services; The role of medical laboratory; Quality in health services; Laboratory procedural norms; Medical aspect of terminologies; malaria diagnosis in medical laboratory; Guidelines in malaria diagnosis; Compliance with procedural norms in diagnosis of malaria.

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List of abbreviations

DRC	= Democratic Republic of Congo
MUCHS	= Muhimbili University College of Health Sciences
NCT	= Nursing Council of Tanzania
OPD	= Out Patient Department
USAID	= United State Agency for International Development
WHO	= World Health Organization

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ANNEX A

THE HANDLING AND PROCESSING OF SPECIMENS IN THE ASSESING LABORATORY SERVICES IN TANZANIA

Observation Guideline

Part 1: Factors that may potentially influence the collection and processing of blood specimens

Research Sample No.	<input type="text"/>	<input type="text"/>	<input type="text"/>				
Sample Identification No.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>			
Date	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Venue	<input type="text"/>	<input type="text"/>					
Time	<input type="text"/>	<input type="text"/>					
Day of the week	<input type="text"/>						

Category of Personnel who collect specimen

Staff Nurse	<input type="checkbox"/>
Trained Nurse	<input type="checkbox"/>
Laboratory Technologist	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

Category of Personnel who examine specimen

Laboratory Technologist	<input type="checkbox"/>
Laboratory Technician	<input type="checkbox"/>
Laboratory Assistant	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>

Category of health worker who collect the results from the laboratory and file in the patient records.

Staff Nurse

Trained Nurse

Laboratory Technologist

Part 2: Collection and processing of blood specimens

1. Collection of blood specimen

Norms	Compliance 2	Non compliance 1	Not applicable 0
<ul style="list-style-type: none">- wash hands- cleaning the finger of the patient with prescribed antiseptic- wiping the first drop of the blood- putting small drop on slide- spread the drop over the slide using spreader at 45 °-C- Put 3 drops of blood on to the slide- Make a smooth circle using a corner of a slide			

2. Transporting to the laboratory

Norms	Compliance 2	Non compliance 1	Not applicable 0
<ul style="list-style-type: none">- put the prepared specimen immediately in the transporting tray- take preparation to the laboratory in less than 30 minutes- cover the tray to avoid specimen contamination			

3. Processing of the specimen

Norms	Compliance 2	Non - compliance 1	Not applicable 0
<ul style="list-style-type: none">- place thick film in the undiluted Field stain A for 7 seconds- Place in the water for 10 second- place thick film in the undiluted Field stain B for 2 seconds- Place in another Container of water for 10 second- Place vertically in the drying rack			

4. Microscopic examination

Norms	Compliance 2	Non compliance 1	Not applicable 0
<ul style="list-style-type: none">- add a drop of immersion oil into a smear- examine by 100 power objective malaria parasites- examine in not less than 5 minutes to confirm the result			

5. Recording

Norms	Compliance 2	Non compliance 1	Not applicable 0
<ul style="list-style-type: none">- Enter the result into the record book as soon as you complete the investigation.- Place the documented result into the rack immediately for ward collection.			

6. Feedback

Norms	Compliance 2	Non compliance 1	Not applicable 0
<ul style="list-style-type: none">- collect the documented results from the laboratory at intervals of 30 minutes- place the documented results immediately in the appropriate recording file			

7. Laboratory result for malaria parasites:

Positive

Negative

ANNEX C

PROCEDURAL GUIDELINE FOR ESSENTIAL LABORATORY INVESTIGATION FOR MALARIA PARASITE IN TANZANIA

Acute attack of malaria is considered, as an emergency condition needs to be taken care with. Government of Tanzania recommends field stain method to be used as essential test for malaria parasite. In order to get reliable result the following procedures are recommended:

A. Collection of blood specimen from patient:

1. Wash hands
2. Clean the finger of the patient with prescribed antiseptic
3. Whipe the first drop of the blood
4. Putting small drop on slide
5. Spread the drop over the slide using spreader at 45 °-c
6. Put 3 drops of blood on to the slide
7. Make a smooth circle using a corner of a slide to mix blood

B. Transporting blood slide specimen to the laboratory

1. Put the prepared specimen immediately in the transporting tray
2. Take preparation to the laboratory in less than 30 minutes
3. Cover the tray to avoid specimen contamination

C. Processing of the blood slide specimen

1. Place thick film in the undiluted Field stain A for 7 seconds
2. Place in the water for 10 second
3. Place thick film in the undiluted Field stain B for 2 seconds
4. Place in another container of water for 10 seconds
5. Place vertically in the drying rack

D. Microscopic examination of blood slide for malaria parasites

1. Add a drop of immersion oil into a smear
2. Examine by 100 power objective malaria parasites
3. Examine in not less than 5 minutes to confirm the result

E. Recording and feedback of the result

1. Enter the result into the record book as soon as you complete the investigation.
2. Place the documented result into the rack immediately for ward collection.
3. Documented results should be collected from the laboratory at intervals of 30 minutes
4. Place the documented results immediately in the appropriate recording file

Note: whenever possible, blood film should be prepared from non ant coagulated capillary blood, as the red cells tend to form marked rouleaux in ant coagulated blood, making staining difficulty and blood washed off the slide. Also staining time may need to be changed depending on the batch of stain used. Some laboratory personnel prefer to use Field's stain A to which has been added 2 drops of Cetavlon (20% Cetrimide) to every 50ml of stain.

ASSESSING THE HANDLING AND PROCESSING OF SPECIMEN IN THE MEDICAL LABORATORY SERVICES IN TANZANIA

CHAPTER 1

1.1. INTRODUCTION

The history of the laboratory services in Tanzania goes back to the German era in 1885 when Mr. Gustav Giemsa, a German scientist, established a laboratory for health services in Tanzania for the first time. (Tanzania 2002:1).

It was through the Ministry of Health at that time that the laboratory in Tanzania was used to conduct research for tropical diseases such as malaria and tuberculosis. Since the 1800s laboratory services have been part of the health facilities for the diagnosis of diseases and their management.

Presently Tanzania has over 3000 laboratory facilities owned by government and private institutions (Tanzania 1998: 2). Some of these laboratories provide services free of charge while others, especially independent laboratory facilities, charge for services provided. The majority of the totally independent and privately owned laboratory facilities are typically located in areas where the population is dense i.e. in towns and cities where people can afford such services. In private laboratory facilities, a request for laboratory investigation is not necessarily ordered by a clinician, but a patient him/herself can visit the laboratory and request for the services she/he needs (Tanzania 1998: i).

The laboratory services in Tanzania form an integral part of the national health system. The entire network of laboratory services contributes effectively to quality health care

services through diagnosis of diseases and in so doing assists the community to take measures for disease prevention (Tanzania 1998: i).

Following global trends, Tanzania supports the principles of primary health care to increase accessibility of health services. (WHO 1978: 7). This also pertains to laboratory services. To increase the effectiveness and accessibility of laboratory services, the Ministry of Health emphasized the need to improve the handling, appropriate processing and production of accurate results of specimens. This resulted in the issuing of medical laboratory guidelines in an attempt to improve laboratory services (Tanzania 1998:12). The Ministry of Health further reacted to the concept of integrated health services by developing appropriate human resources for laboratory services to meet some of the health needs of the population (Tanzania 1998:12). The roles of medical laboratory services in this process become clear in an "Agenda for Action" where the health laboratories are challenged to improve medical laboratory health care services. This policy document included capacity building to meet prospective needs and demands of the population (WHO 1991: 25-27).

The Government of Tanzania puts emphasis on the primary health care approach as the only way to improve and maintain the health of the Tanzanian population. However, the primary health services delivery is faced with difficulties in delivering comprehensive and quality laboratory services, particularly the handling and processing of specimens and production of accurate results. (Tanzania 2002:12).

This study has assessed these processes and focused on the handling and processing of the malaria blood specimens in Tanzania.

1.2. BACKGROUND AND CONTENT OF THE STUDY

1.2.1. Geographical information Of Tanzania

The study was conducted in Dar es Salaam, Tanzania. Tanzania is located in sub-Saharan Africa. Burundi, Rwanda Congo DRC, and Zambia are on the west side, while the Indian Ocean borders eastern side. Kenya and Uganda form the north border while; Mozambique and Malawi form the southern border.

Dar es Salaam, although not the capital city of the country is the business hub of Tanzania with a population of about 6 million persons. The city has over 200 health laboratories of different sizes and levels. Laboratories are typically situated in dispensaries, health centers, and hospitals or act as independent facilities (Tanzania, 1998:15-16).

1.2.2. Disease profile

Fernandez (2002) states “Malaria infections remain a devastating global problem” and 300 – 500 million cases are annually reported, Internationally 1.5 –3. 5

Million of deaths occur annually. Of these deaths the overwhelming majority are among children aged 5 years or younger (Fernandez. 2002: 2- 3). High malaria transmission occurs in Africa south of the Sahara where *P. falciparum* predominates and causes an estimated 90% of the death attributable to malaria worldwide (WHO 1999:12-13).

Malaria is the commonest communicable disease in Tanzania and probably the worst endemic country and the highest transmission area in East Africa (Mboera, Kamugisha, Barongo, Rumisha, Msangeni, Molten and Kitua. 2004:12). Malaria claims more life than any other disease in Tanzania causing tremendous health and economic burden (Mboera et al 2004:12). The geographical distribution of malaria depends on climatic conditions necessary for the survival of the vector and the parasites. In warm humid coastal areas like Dar es Salaam and around major lakes, malaria is transmitted throughout the year. The remaining parts of the country malaria are unstable and transmission occurs during part of the year while in few areas it occurs as an outbreaks.

Malaria is caused by infection with one or more of the four species of plasmodium species i.e. *P. falciparum*, *P. Vivax*, *P. Oval* or *P. malaria*. Malaria is transmitted by the bite of an infective female mosquito of anopheles species. 41% of the world population live in areas where malaria is transmitted in this manner e.g. parts of Africa – (Cheesbrough 1998: 45)

1.2.3. Health system in Tanzania.

The function of health system in Tanzania follows the bottom up approach. Services are decentralized to the community where the services are offered by Primary health care workers, who are responsible for diagnose and treatment of common diseases and advise for referral to the nearby health facility. Health facilities start with a Dispensary, a Health centre, a District hospital, a Regional hospital, a Referral hospital and a National hospital. Each of the facilities has its own laboratory. Government laboratories include the National Central Pathology Laboratory, Zonal Referral Laboratories, Regional and District Laboratories, Private laboratories, Health centers and Dispensary Laboratories.

The National Central Pathology Laboratory was the first referral laboratory to be established in the country. There are four (4) Zonal Referral Laboratories: Bugando Medical Centre Laboratory; Kilimanjaro Christian Medical Centre Laboratory; Mbeya Referral Hospital Laboratory; and Muhimbili National Hospital laboratory.

Regional and District Laboratories are located at the district and regional head quarters. Others are Private laboratories, Health centers and Dispensary Laboratories.

Laboratory services in Tanzania are currently organized in such a way that they serve both clinical and health research needs. Services offered by the laboratories in Tanzania are: parasitological tests (to detect parasites including malaria parasites); microbiological tests (to detect bacteria); hematological test (to examine blood and its components); clinical chemistry tests (to detect biological chemistry in the body); and virological tests (to detect virus existence).

1.2.4. Laboratory services policy and procedure in Tanzania

Laboratory services in Tanzania form an important part of quality health care delivery. It gives health provision a scientific foundation by providing accurate information to those responsible for treating patients, monitoring their response to treatment, deciding on health priorities and allocating resources, monitoring the development and spread of infections and dangerous pathogens, investigating preventable premature loss of life and deciding on effective control measures against major preventable diseases (Tanzania 1998:1). Without reliable and quality laboratory support; patients are less likely to receive the best possible quality health care. Resistance to essential drugs will continue, as the sources of the infection may not be identified correctly (Tanzania 1998:1). Epidemics and spread of the major diseases may not be controlled as the diseases will

continue infecting others without being diagnosed and treated and hence rapid spreading; reliable and valuable financial, material and human resources may be diverted to the Management of otherwise preventable diseases.

Poor laboratory services impact on patient stay and therefore costs for the treatment. A disease, which is not diagnosed properly, cannot be treated effectively with appropriate drugs. The patient will be treated empirically combining various drugs, which increases the cost of treatments. Admitted patient will stay longer time for observation of treatment and improvements. Patients have been reported to attend two or three clinical laboratory facilities to validate their results. As a result cost escalate.

Laboratory services can be accessed seven days a week and 24 hours a day. The blood specimens are usually collected at clinics, OPD or at the admission wards and then transferred to the laboratory by ward attendants, ward nurses or laboratory technicians. At night only emergency cases of suspected severe malaria, specimens are collected from the admitting ward and transferred to the laboratory to be examined by the laboratory staff on duty.

1.3. BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

At the beginning of 1990, laboratory services were observed to be not providing the quality of services required. Complaints about poor laboratory services forced the government to establish a laboratory professional council (Tanzania 1998:1). The council was charged with the responsibility of establishing a professional code of conduct and follow-up on professional ethics. The council had a further responsibility of

sensitizing laboratory personnel to respond to the professional code of conduct with regards to both their attitudes and practice.

The professional codes of conduct ensure that laboratory personnel are well trained and work within recognized standards. Codes of professional conduct therefore ensure also that medical laboratory personnel are competent and follow the procedural norms for diseases diagnosis and that the medical laboratory profession is dedicated to services of the patients and provide quality laboratory services. There is a perceived discrepancy by health care workers, between provisional diagnosis of malaria and confirming result from the laboratory. This means between clinical (general observation of typical symptoms, non instrument) diagnoses and confirming (instrumental investigation) laboratory results of malaria patients in Muhimbili National Hospital. Patient provisionally diagnosed for malaria in few cases can be confirmed by laboratory results.

1.3.1 Statement of the research problem

The study is based on the assumption that a perceived discrepancy between the clinical Diagnosis of malaria in children and the laboratory results that are used to confirm such a diagnosis, may be attributed to the handling and processing of blood specimens.

It is also assumed that incompetent of health personnel including laboratory workers, who are responsible for patient preparation, specimens' collection and transportation, might contribute to the discrepancies observed in malaria diagnosis.

1.4. AIM OF THE RESEARCH

The aim of this research are: To assess the competence and the extent to which health personnel in Muhimbili National Hospital comply with the formalized official, scientific approved policies and procedure for handling and processing of the blood specimens of patients with typical symptoms and provisional diagnosis of malaria, the killer number one of children in Tanzania and to compile guidelines that will result in improving the handling and processing of blood specimens in the Muhimbili National Hospital, Tanzania.

1.5. OBJECTIVES OF THE RESEARCH

The objectives of the research were:

To assess and describe the level of compliance of health personnel in handling and processing of malaria blood specimens from patients in Muhimbili National Hospital.

To determine and describe the competence of health workers in collecting, preparing, processing and investigating the malaria blood specimens.

To describe the similarities and differences between the clinical diagnosis and the laboratory result for confirmation of malaria.

1.6. ASSUMPTIONS UNDERLYING THE STUDY OF THE HANDLING AND PROCESSING OF BLOOD SPECIMENS IN MEDICAL LABORATORY SERVICES

Professionals in health laboratory facilities need to observe a code of professional conduct, to ensure that, the medical laboratory personnel are competent and follow the procedural norms (Tanzania 1998: i).

Health care providers perceived discrepancy by the between clinical diagnoses and confirming laboratory results of malaria patients in Muhimbili National Hospital. This study is therefore based on the assumption that this perceived discrepancy between clinical diagnoses and laboratory results of malaria parasites in pediatric patients might be linked to the processes and procedures related to the handling and processing of malaria blood specimen in the medical laboratory services. It is also assumed that incompetence of health personnel including laboratory workers has an effect on complying with the formalized official, scientifically approved policies and procedure of handling and processing of the blood specimens

1.7. SIGNIFICANCE OF THE STUDY OF HANDLING AND PROCESSING OF BLOOD SPECIMENS

Wrong laboratory results contribute to wrong diagnoses resulting in the unnecessary wrong treatment and ultimate premature death due to malaria within the community in Tanzania, particularly among children less than five years of age. In addressing identified possible reasons for the discrepancies between the clinical diagnosis and laboratory

results, mortality rates due to the delay or wrong diagnosis and consequent inappropriate treatment of malaria, could be reduced.

More effective laboratory processes will not only improve the diagnosis and treatment of malaria, but also other diseases dependent on accurate laboratory results such as typhoid fever, worm manifestations, and other infectious diseases.

1.8 OPERATIONAL DEFINITIONS OF CONCEPTS USED IN THE RESEARCH REPORT

- **Laboratory technician** is a person qualified for laboratory activities with an advanced degree, diploma or diploma in health laboratory sciences.
- **Laboratory assistant** is a person qualified for laboratory activities with a certificate in health laboratory sciences.
- **Laboratory technologist** is a professional title for laboratory technician and laboratory assistant
- **Staff nurse** is a nurse trained at a diploma level and who is registered with the Nursing Council of Tanzania.
- **Trained nurse** is a nurse trained at certificate level and who is registered with the Nursing Council of Tanzania
- **Blood specimen** is blood drawn from a patient for investigation with the aim of verifying diagnosis, which will result in appropriate treatment.
- **Specimen handling** includes collecting a specimen, transporting this safely to the laboratory and keeping the specimen viable for investigation.

- **Specimen processing** is the action of preparing the specimen for the actual laboratory investigation, for example, drying, fixation and staining in preparation for the microscopic viewing.
- **Microscopic investigation** is a process of viewing the specimen through the microscope, with the aim of diagnosing a problem or disease, which will result in a scientifically based outcome.

1.9 SCOPE AND LIMITATIONS OF THE STUDY

For reasons of convenience for the researcher, the study was done in Dar-es-Salaam city in the Muhimbili National Hospital. A limitation is that other health facilities were not included in the study. The results of the study may therefore not be transferable to other laboratories in Tanzania.

Due to the fact that the study focuses on the handling and processing of blood specimens for malaria parasites, issues such as the validity of reagents and microscope techniques and other factors that may influence laboratory procedures were not included in the study.

1.10 SUMMARY

Laboratory services in Tanzania started during colonial time of the German era in 1885. Laboratory was used to conduct research for tropical diseases such as malaria and tuberculosis. After independence the laboratory services in Tanzania were promoted and now form an integral part of a national health system. It is perceived that laboratory services are not providing services of expected quality. Malaria infections remain a

devastating global problem. Millions of deaths occur annually. Of these deaths, majorities are among children aged 5 years of age or younger. The health laboratory service structure in Tanzania is decentralized and starts with dispensaries, health centres, district hospitals, regional hospitals, referral hospitals and a national hospital. In that order each of these facilities have their own laboratories.

The health laboratory council of Tanzania established a code of professional conduct, which therefore ensures that, the medical laboratory personnel are competent and follow the procedural norms. There is a perceived discrepancy between clinical diagnoses and confirming laboratory results of malaria patients in Muhimbili National Hospital.

This study is therefore based on the assumption that this perceived discrepancy between clinical diagnoses and confirming laboratory results of malaria parasites in pediatric patients might be attributed to the processes and procedures related to the handling and processing of malaria blood specimen in the medical laboratory services. It is also assumed that incompetence of health personnel including laboratory workers can be the cause discrepancies. Hence the aim of this research is to assess the competence and the extent to which health personnel in Muhimbili National Hospital comply with the formalized official, scientific approved policies and procedure of handling and processing of the blood specimens.

CHAPTER 2

LITERATURE REVIEW

2.1. INTRODUCTION AND HISTORICAL BACKGROUND

According to the report from the Joint Scientific Conference for Health Laboratory Services in Tanzania, medical, laboratory services in Tanzania were established in the then Tanganyika in the late 19th Century – during the German rule. The first government laboratory was established at Ocean Road Hospital in Dar es Salaam in 1897. Dr. Robert Koch visited and worked in this area on several occasions while undertaking malaria and sleeping sickness research. Ocean Road Laboratory is therefore the first site of a health laboratory facility in Tanzania. In the early 1960s this became the “Central Pathology Laboratory (CPL)”, under the Ministry of Health. It also became the referral laboratory and teaching institution for laboratory auxiliaries, technicians and pathologists in the country.

The role of a laboratory was stipulated as; provision of reliable laboratory reports on patient specimens; provision of epidemiological data to facilitate better surveillance; recognition of epidemic diseases and consequently control of communicable and non-communicable diseases; provision of competent health personnel who will assist in reaching an early and correct diagnosis and therefore prompt treatment or management of patients; preparing, producing and testing the efficiency of laboratory reagents, drugs and vaccines. (Shija 2003: 9)

2.2. LITERATURE REVIEW ON HANDLING AND PROCESSING OF SPECIMEN IN MEDICAL LABORATORY

2.2.1. The important role of laboratories as an integral part of effective health services, integration of laboratory services at different level of health care and scope and responsibilities of effective laboratory services

There are a number of challenges health laboratories are facing in Tanzania. These problems include: -shortage of qualified laboratory staff of all cadres. (Shija 2003: 12). Shortages of most essential reagents and chemicals lack of service and maintenance of equipment such as microscope, no quality assurance to monitor techniques and results and lack of supervision (Muhimbili University College of Health Sciences (Shija 2003: 12).

It is common practice for untrained personnel such as laboratory attendant to perform diagnostic work in laboratories Other challenges include; use of very old equipment which lack regular repair and maintenance; poor storage of laboratory reagents due to lack of knowledge on the side of health personnel and lack of storing places such as refrigerators and special cupboards; and poor transporting vessels, medium or equipments used by health personnel (Shija 2003: 12). All over the country, to date, the health workers including laboratory personnel could do not meet the government requirements put down for the number of personnel in a given facility, resulting in compromised services (Muhimbili University College of Health Sciences (Shija 2003: 12).

Effective laboratory facilities and services form an important part of good quality of health care. It gives health services a scientific foundation by providing accurate information to

those with the responsibility of treating patients and monitoring their response to treatment. Scientific based laboratory results assist in determining priorities and allocation of resources, monitoring the development and spread of infections and dangerous pathogens. Laboratory outcomes will result in investigating preventable premature loss of life and deciding on effective control measures against preventable diseases. Without reliable laboratory support and quality laboratory services patients are more likely to receive less effective and compromised health care services, because the sources of disease may not be identified correctly, epidemics and the spread of major communicable diseases will not be checked reliably (Cheesbrough 1998: 1.1).

2.2.2 Quality in laboratory services

Huber (2000:610) defines quality as “characteristic of and the pursuit of excellence”. He also refers to Setler (1992), who defined quality in terms of effectiveness, efficiency, benefit and appropriateness. Quality service is thus the degree at which services are well executed, effective, efficient and appropriate Huber (2000:610) refers also to Omochonu (1990), who define quality as two independent parts, namely; quality as conforming to standards, norms and guidelines. It is thus required of laboratory personnel to adhere to and hence provide quality service. Secondly as meeting one’s expectations. Laboratory professionals need to meet the expectations of their clients, sick people such as malaria patients by providing accurate results. Accurate results cannot be obtained without following the standards, norms and guideline pertaining to the handling and processing of specimen in laboratory services. Professional standards in medical laboratory services are documented in various guidelines in which laboratory workers have to abide by as a basis for quality services.

Quality control in terms of detection and recognition of parasites include; adequate training and supervision of all personnel; appropriate handling and processing of specimens; adhering to time norms when analyzing specimens; displaying charts and art work which show the identifying texture and diagnosing norms of parasites; appropriate use of equipment; lights control, magnification and constant focusing when examining specimens microscopically and continuous focus on the specimen (Cheesbrough,1998: 41).

2.2.3 Factors influencing quality in laboratory services

Service quality in medical laboratory is influenced by a number of variables. Continuous improvement of all stages of the diagnostic process is paramount in order to get accurate results.

There is a countrywide shortage of qualified laboratory personnel. To ensure quality of the result there is need to evaluate the performance of the laboratory operators, reagents, procedures and measurement equipment (Shija 2003: 13).

2.2.4. Policies and procedural norms with regards to diagnosis and treatment of malaria

2.2.4 .1. Health laboratory policy in Tanzania

Tanzania has not yet designed or developed its specific and more practical check list guide for this deadliest disease to suit its environments and professionals who practices malaria investigation regarding the handling and processing of specimen for malaria parasite. The checklist guidelines should be developed and displayed or posted over the laboratory premises to remand an individual performing laboratory investigation of malaria. Health workers use the general knowledge obtained from training institutions to perform all activities involved in the diagnosis of diseases including malaria. However a code of ethics for health laboratory personnel emphasizes that, laboratory personnel are responsible for the logic process from the acquisition of the specimen to the production of data and final report of test results (1998:11).

An individual working in the health laboratory is responsible to exercise professional judgments, skills and care while meeting established standard. It therefore required that all procedural norms be followed in order to get reliable result (Tanzania Standard Guidelines for Health Laboratory Services, 2003:14- 15). Tanzania, Standard Guidelines for Health Laboratory Services recommend blood film for malaria parasite as essential test and recommend Field stain A and B methods without being diluted. The staining solutions are isotonic with blood plasma; therefore cells and parasite are well preserved during staining especially in fresh blood. If the specimen is to be well made and stained it is essential to use only perfect clean slides that are free from surface-bloom, scratches

and grease (Cheesbrough, 1998:37). Clean hands free of greases enhance the reliability of results in diagnosing malaria parasites.

2.2.4.2 International policy and procedural norms regarding blood specimen handling and processing for malaria parasite

Internationally accepted normal procedure for handling and processing of blood specimens for malaria parasites include the fact that one or three drops of a blood will suffice for the preparation of thick blood film (Cheesbrough 1998:37). Well-prepared and well-stained thick blood film remains currently the golden standard for detecting and identifying malaria parasites. Thick blood is used to concentrate the parasite. Field stain A and B are the reagents recommended for malaria diagnosis. Field rapid method gives beautiful staining of malaria parasites in thick film. Using field stain, the white cells are well stained also and reticulocytosis can be detected in thick film. Stained white blood cells and detection of reticulocytosis assist clinicians in judging the acuteness of malaria attack (Cheesbrough 1998:149).

2.2.4.3 International Requirements for specimen handling and processing

Materials and reagents needed are; clean grease free microscope slide; sterile lancet; alcohol 70% (swab) or ether; flat and smooth table, container of Field's stain A, container of Field's stain B and 2 container of clean water. (Cheesbrough 1998:37).

2.2.4.4 Procedure for blood specimen collection

Blood sample for malaria diagnosis can be obtained by two methods; directly from the lobe of an ear or finger or heel. The procedure involves the cleansing of the lobe or the finger or heel using swabs moistened in 70% of alcohol, allowing the area to dry, using sterile lancet to prick deeply the lobe or finger or heel, wiping off the first drops of blood and collecting the next drops for the thick films. The preparation of a thick smear should be made within an hour from the time of collection, as the delay may impact on the results thereof. The smears may be washed away during staining and washing. A method of preparing a thick blood film is as follows:

1. Collect a drop of blood in the middle of the slide. Touch the slide with the drop of blood only avoiding touching the skin of the patient.
2. Using the corner of the spreader to make a thick film by spreading a large drop of blood to the correct thickness to form a square with sides about 1.5cm. Mix blood on the slide as little as possible to avoid excessive rouleaux.
3. Allow the film to dry protecting them from flies, ants, and dust. This can be done by storing them in a box containing a drying agent until they can be stained
4. Always label the specimen with patient name on the slide. (Cheesbrough 1998:147- 148).

2.2.4.5 Procedure for Field's staining and microscopic examination of blood films.

1. Field stain A and B are used without being diluted. When the thick film is completely dry, dip the slide into Field's stain A, and count up to 7 seconds. Drain by touching a corner of the slide against the side of the container.
2. Wash gently in a container of clean water for 10 seconds.

3. Dip into Field's stain B, and count 2 seconds. Drain as described in step 1.
4. Wash gently in another container of clean water for 10 seconds.
5. Allow the film to dry by standing the slide in a draining rack.
6. Examine the film microscopically, using the 100x oil immersion objective with the condenser aperture fully open (Cheesbrough 1998: 150).

The result obtained is immediately recorded into the record book. As soon as the result has been recorded, the result slip is placed in the tray for laboratory attendant to select them and put in appropriate racks for delivery to the particular ward or clinic. The procedure for staining, microscopic examination and reporting feedback should take not more than 15 minutes.

2.3. SUMMARY

The first government laboratory was established at Ocean Road Hospital in Dar es Salaam in 1897 by Dr. Robert Koch a German colonialist undertaking malaria and sleeping sickness research. There are a number of challenges that health laboratories are facing in Tanzania today. Those problems include: -shortage of qualified laboratory staff of all cadres; shortages of most essential reagents and chemicals, lack of service and maintenance of equipment such as microscope, no quality assurance to monitor techniques and results, lack of supervision and lack of quality control mechanism in term of detection and recognition of parasites. Others are: inadequate training and supervision of personnel; lack of appropriate policy and procedural norms in handling and processing of specimens which will assist in adhering to norms when analyzing specimens. Tanzania has not yet designed or developed the checklists guidelines for investigation of this deadliest disease, regarding the handling and processing of specimen for malaria parasite. The knowledge for normal procedure of handling and processing of blood

specimens for malaria parasites is being taught during normal academic training for health personnel. The steps include: procedure for blood specimen collection; procedure for Field's staining and microscopic examination of blood. The steps to follow need to be reviewed by professionals and then be documented in checklist guide for investigation of malaria and then posted at laboratory premises as laboratory aid for investigating malaria. This will reduce error in performing the investigation and hence improve the practice and increase the chances of producing accurate results.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. RESEARCH DESIGN

The research design is descriptive design to explain apparent discrepancies between clinical diagnosis and laboratory results of malaria blood specimen in confirming malaria disease. A survey was done using observation guidelines based on existing policies and norms. The study followed a quantitative approach.

3.2. RESEARCH POPULATION

3.2.1 Type of research population

The target populations were blood specimens taken from suspected malaria pediatric patients in Muhimbili National Hospital.

3.2.2. Sample and Sampling Technique

Blood slide specimens from 85 Pediatric patients were collected from pediatric wards, the pediatric clinic and laboratory itself.

A simple random technique was used to select blood specimens from patients with typical symptoms and a provisional diagnosis of malaria as indicated on their medical records. Observation was done at random, among patients ordered for blood investigation of malaria parasites. Blood specimens were collected from any pediatric

patient suspected and provisionally diagnosed malaria in a given time of the day. Each patient in pediatric units, diagnosed of malaria was followed up through file number. Available nurses responsible for blood collection were assigned these files for blood collections. Observation was done to any available nurse who involved in blood collection. Investigation forms ordered by doctors were given file number. A researcher utilized these file number and added code number for these sample in data collecting tool for follow up purposes **(See Annex A)**. Each person assigned for blood collection was followed up and observation done. Each specimen that was observed during blood collection was also marked for follow up. Laboratory specimen marked for research was communicated to the laboratory. Communications between pediatric units, laboratory and researcher were established to ensure that all samples of blood collected should also be observed in the laboratory. A researcher followed up all specimens, which are due for examination and for recording. Each specimen was followed in the laboratory utilizing code number and file number in data collecting tool and investigation form. Observation of the collecting and processing of blood specimen was done with specimens from the different patients available at different time. Specimens were collected during morning, afternoon and evening for seven days of the week. The temporal distribution of blood specimen represented factors such as different categories of health workers, time of the day, the day of the week that could influence results.

Malaria blood specimens were observed from the point of collection to the point of microscopic investigation of the specimen at the laboratory in Muhimbili National hospital. Each collected specimen was observed during collection and followed up through to the time of investigation and producing feedback using code number, and patient number available in data collecting tool. Time factor was also considered during observation.

3.3. APPROACH TO THE RESEARCH

3.3.1. Data Collection

Random selection of specimen was done. Specimen was collected from any patients available at different time. Data were collected by the researcher himself, through observation to compare the actual practice with the policies and procedural norms of collecting, preparing and examining blood specimens in the diagnosis of malaria disease, Blood specimens were collected from any and different pediatric patient suspected of malaria available at different time. The observation was done directly to the specimen in pediatric laboratory.

Observations were done at the points of blood collection, to establish if the required procedures and norms were followed in blood collection. The same observation was also done for transportation of specimens, if the right medium of transport, techniques and procedure were followed. Techniques and procedural norms was observed for specimens processing and microscopic examination with the aim of knowing if laboratory personnel were following the required procedural norms for specimen processing and microscopic examination. Through specimen code and file number specimen was identified. The observation was done directly to the specimen in pediatric laboratory. Recording procedures in the laboratory and feedback to the patients by the health personnel were also observed to see if the recording and feedback satisfied the required time norms of 30 minutes agreed upon and feedback to the patient after microscopic examination of the specimens. The actual procedures done were compared to the procedural norms. Using data collecting tools the categories of compliance, and non-

compliance to procedural norms were used. Field notes taken during the observation enriched the data.

In order to fulfill the aim of the research, an observation guideline was designed based on international accepted procedures for investigating malaria (annexed as checklist) to assist the researcher in identifying procedural norms. It is thus, the knowledge of understanding that whether health laboratory personnel follow the procedural norms for specimen handling and processing can only be obtained through observation of health personnel while performing specimen handling and processing and microscopic examination.

3.3.2. Data Analysis

Data collected has been analyzed quantitatively using SPSS software package. Data were analyzed in terms of frequency tables and cross-tabulations. Variable investigated include: Time of the day (morning, afternoon and evening), seven days of the week, categories of health workers and procedural norms for malaria investigation. The temporal distribution of blood specimen represented factors such as different categories of health workers; time of the day; the day of the week.

A systematic comparison of the results against the existing policies and norms has assisted the researcher to identify discrepancies in the procedures and processes of blood sampling and investigation. Conclusions based on the observation guidelines were made and descriptive statistics (frequency, percentage) were used.

3.3.3. Ethical issues and informed consent

Research clearance was obtained from the Research Ethical Committee of National Institute of Medical Research and the University of South Africa. Further more permission was obtained from the head of the Muhimbili National Hospital. The heads of pediatric and clinical laboratory department within the hospital were informed verbally of the aim of the study and its importance. The study employed a standard explanation. The aim and the information about the research were communicated to each block manager. Personnel whose knowledge, attitude and actions impacted direct on the study results were informed about the research project, but were not informed on the details in order to avoid bias as well as the Hawthorne effect on research results. The study used quantitative techniques (Observation guideline) with minimal risks to the patients from whom blood was collected. Confidentiality of all observed specimens and participants were assured as the results were given back to the responsible people after examination. No examination results were taken out of the hospital.

3.3.4 Pretest of the Data Collecting Tool

The observation guideline was tested on handling and processing of blood specimens.

Blood specimens from four patients at Muhimbili National Hospital were used, and these were not included as part of the study. During the pilot phase, problematic areas of the research instrument were identified and the necessary modifications done before embarking on the main study. The changes made to the study, based on the information obtained during the pre- testing of the observation guideline, were:

At night specimens were collected for emergency only and for differential diagnosis of very complicated cases. The research was therefore not conducted during the night.

The researcher also observed that differentiation between laboratory technician and laboratory assistant were not accommodated in the observation guideline during blood collections, it was decided to use only one title for health laboratory technician, namely, laboratory technologist. It was found that blood smears being collected are usually thick smears. It was therefore decided to exclude the variables, which indicates the kind of blood smear, which has been collected.

Due to the fact that only thick smears were collected, it had to be kept in mind that some of the variables designed for thin smear were ignored and removed from the checklist. Then variables for the checklists namely: specimens' collection, processing of specimens, microscopic examination and feedback and recording were used as (22) norms as indicated in observation guideline (**see annexure A**)

3.4. VALIDITY AND RELIABILITY

The following strategies to enhance the validity and reliability of the study were observed:

- Consistency in data collection because only the researcher collected the data;
- Using international accepted policies and norms for investigating malaria as framework for the study;
- Using objective computer software to analyze data;
- Temporal sampling to accommodate differences in terms of days of the week and time of the day; and
- Although staff members were informed about the study and the necessary consent obtained. The observation was done as part of continuous assessing the procedures being performed to minimize the Hawthorne effect.

3.5 SUMMARY

The study conducted used quantitative approach, descriptive design. A survey was done using observation guidelines based on international accepted policies and norms. The population selected was all the blood specimens taken from suspected malaria pediatric patients in Muhimbili National Hospital. A simple random technique was used to select 85 blood specimens from patients. Blood specimens were observed from the point of collection through to the point of microscopic examination. Recording procedures in the laboratory and feedback to the patients by the health personnel were also observed. Using guidelines developed, the actual practice was compared with the policies and procedural norms of collecting, preparing and examining blood specimens.

Data collected were analyzed quantitatively in term of frequency tables and cross-tabulations using SPSS software package. Strategies to enhance the validity and reliability of the study were observed. Written Permissions to conduct the study were obtained from the Research Ethical Committee of National Institute of Medical Research (NIMRI), the University of South Africa and the head of the Muhimbili National Hospital (MNH). The pretest was conducted and problematic areas of the research instrument were identified and the necessary modifications done before embarking on the main study.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1. INTRODUCTION

Different categories of health personnel took part in the study: Staff nurses; trained nurses; laboratory technicians; and laboratory assistants.

The following blood specimens were collected from pediatric patients: 9 by Staff nurses; 33 by trained nurses; 43 by Laboratory technologist. Most of the laboratory technologists took part in specimen collection, processing and examination, while nurses took part in blood specimen collection only.

4.2. DATA MANAGEMENT AND ANALYSIS

The table below shows how different health personnel collected blood samples

Table 4.1. Health Personnel that participated in the research study

Category	Total Participated	Number of blood specimens collected
Staff nurse	9	9
Trained Nurse	16	33
Laboratory Technologist	11	43
Total	36	85

Laboratory technologist and nurses had almost equal frequencies of blood specimens' collections. This indicates that all personnel take responsibility of blood specimen collection for malaria diagnosis.

Table 4.2. Specimens collected depending on the time of the day

Time of the day	Number of blood specimens collected
Morning	23
Afternoon	37
Evening	25
Total	85

Blood specimens collected during the day; indicate that the highest frequency of collection of blood specimens observed were taken in the afternoon after the completion of all the clinical work. Patients report from home to attend pediatric OPD and clinics in the morning. The blood specimens for the malaria parasites ordered are not collected immediately in the morning due to shortage of staff. Over working of health personnel has effect in one or more important steps that might be ignored during handling and processing of blood specimen resulting in an error in reporting. Shortages of health personnel observed also affect hospital activities such as ward round, treatment and care. Blood specimens are often collected only in the afternoon. Most of the therapist in Muhimbili National Hospital would not start anti-malaria therapy without confirming the

disease from laboratory. An acute malaria attack should be regarded as an emergency and given high priority for immediate diagnosis and treatments.

Table 4.3. Specimens collected during the weekdays

Weekday	Number of blood specimens collected
Monday	9
Tuesday	24
Wednesday	12
Thursday	16
Friday	7
Saturday	13
Sunday	4
Total	85

It was observed that Muhimbili has the highest peak of admission of pediatric patient on Monday, but deduced that highest peak for collection of blood specimen for malaria was observed on Tuesday. The probable reason is that, due to shortage of staffs, and preoccupation with patients, particularly new admissions, blood specimens from suspected malaria cases which are not in acute form are not given priority for investigation on the same day, as a result, Tuesday with less patient attendance, records the highest peak of specimen collected. Due to the fact that Monday record the highest admission among days of the week, patients admitted after the ward round are less likely to be considered for blood slide examination until the next Doctor's ward round, because laboratory investigation are ordered only by registered medical practitioner using

investigation form, in this case a doctor working in that area is responsible for all laboratory investigations ordered. Most of the pediatric cases for malaria report late after wrong self treatment by mothers. Delay in parasite investigation may cause more and advanced complication due to increasing number of parasites in the body causing more harm to the body. Over working of health personnel with health care activities contribute towards the tendencies of ignoring some of the very important procedural norms for specimen handling and processing for malaria parasite, resulting in wrong diagnoses.

Table 4.4. Compliance of Health Personnel with Specimen Collection and Transportation (see annexure A for observation guideline)

Procedure	Frequency		Percentage %	
	Non-compliance	Compliance	Non-compliance	Compliance
Wash hands	78	7	91.8	8.2
Clean the finger with antiseptic	2	83	2.4	97.6
Wipe the first drop of blood	54	31	63.5	36.5
Put 3 drops on to the slide	5	80	5.9	94.1
Make smooth circle	11	74	12.9	87.1
Put specimen immediately into the transporting tray	56	29	65.9	34.1
Take preparation to Lab within 30 minutes	66	19	77.6	22.4
Cover the specimen tray to avoid contamination	83	2	97.6	2.4

The information obtained shows that the highest percentage of non-compliance was observed in:

- Washing hands;
- Wiping the first drop of blood;
- Putting specimens immediately in the transporting tray to the laboratory;
- Taking the specimen collected to the laboratory within 30 minutes; and
- Covering the transporting tray of the specimens to avoid contamination.

Only two personnel managed to cover the specimens transporting tray to avoid contamination. The negative results were approximately 73%. Table 4.4 compares the results from different health personnel that participated in the study.

4.2.1. Procedural Compliance

Different personnel were observed for each procedure. The tables below show staff compliance status for each procedure with high percentage of non-compliance that probably contributed towards high percentage (73%) of a negative result.

4.2.2. Collection and transportations of blood specimens

The tables below show compliance of health personnel with specimen collection:

Table 4.5. Washing hands

Category	Compliance		Non Compliance		Total
	Frequency	Percentage	Frequency	Percentage	
Staff nurse	0	0%	9	100%	9
Trained nurse	2	6.1%	31	93.9	33
Laboratory Technologist	0	0%	43	100%	43
Total	2		83		85

The table indicates that on average almost all staff non-complied with norms in washing hands. This situation may cause contamination to the specimen collected resulting in wrong reporting of the findings.

Whenever possible it is essential to use clean slide which is free from dust, frosting or grease. The slide must be handled only by the edges to avoid finger marking the glass. Many errors in reporting of blood films are due to the use of dirty, especially grease slide, resulting in badly made films or “blood-smudges” which are impossible to stain well and examine satisfactory (Cheesbrough 1998: 147). Cleaning hands for the handling and processing of blood film is therefore a paramount requirement for the reliable result. Greasy material is very common used by our society for skin care and other activities in the day-to-day life.

Table 4.6. Wiping the first drop of blood

Category	Compliance		Non Compliance		Total
	Frequency	Percentage	Frequency	Percentage%	
Staff nurse	9	100%	0	0%	9
Trained nurse	12	36.5%	21	63.5%	33
Laboratory Technologist	10	23%	33	77%	43
Total	31		54		85

Wiping the first drop of blood and squeezing more blood increases the chance of parasites to be included in the specimens. Malaria parasites are located more centrally

than peripheral. First drop is more peripheral than drops coming from the squeezed blood. First drop has the highest chance of negative tendencies. The more central the blood the more the possibilities of finding malaria parasites. Probably this has influenced the end results of producing negative results in terms of diagnosis.

Table 4.7. Putting specimen collected immediately into transporting tray

Category	Compliance		Non Compliance		Total
	Frequency	Percentage%	Frequency	Percentage%	
Staff nurse	9	100%	0	0%	9
Trained nurse	11	33%	22	67%	33
Laboratory Technologist	9	21%	34	79%	43
Total	29		56		85

Staff nurses complied with this variable of putting specimen immediately into transporting tray. Non-compliance is observed with trained nurses and laboratory technologists. Delaying transportation of specimens for investigation will result into late presentation of specimen to the laboratory and therefore delaying in investigation and feedback of results. Delayed treatment of malaria due to unavailable laboratory results may cause complication and possibly death to patient.

Table 4.8. Taking the specimen collected to the laboratory within 30 minutes

Category	Compliance		Non Compliance		Total
	Frequency	Percentage%	Frequency	Percentage%	
Staff nurse	8	89%	1	11%	9
Trained nurse	9	27%	24	73%	33
Laboratory Technologist	2	5%	41	95%	43
	19		66		85

The specimen which are left around in the open space have a high chance of being contaminated with dust and other agents. Moreover collected specimen should be forwarded to the laboratory for immediately diagnosis of malaria to avoid complications thereof.

Table 4.9. Covering the transporting tray of the specimens to avoid contaminations

Category	Compliance		Non Compliance		Total
	Frequency	Percentage%	Frequency	Percentage%	
Staff nurse	0	0%	9	100%	9
Trained nurse	1	3%	32	97%	33
Laboratory Technologist	1	2%	42	98%	43
Total	2		83		85

Cheesbrough (1998: 150) urged that blood film allowed to dry should be protected from flies, ants and dust, which might cause errors in specimen examination. Covering of the transporting tray will prevent the specimens from being contaminated.

Trained nurses have least complied with the following procedures; washing the hands for specimens' collection; wiping the first drop of blood; putting specimens immediately in the transporting tray for transporting to the laboratory; covering the transporting tray to avoid contamination. Trained nurses and laboratory technologists had a very poor performance in the washing of the hands for specimens' collection; wiping the first drop of blood; putting specimens immediately in the transporting tray for transporting to the laboratory; and covering the transporting tray to avoid contamination. Only two-trained nurse had washed hand prior to specimen collection, while only one trained nurse and one laboratory technologist had covered the specimens transporting tray.

4.2.3. Specimen Processing and Examination

Laboratory technologists only did specimen processing and examination. During the research study 85 specimens were processed and examined by laboratory technologists in medical laboratory at Muhimbili national hospital. Among the laboratory technologist, there were laboratory technicians and laboratory assistants. The table below shows general staff compliance for each procedure.

Table 4.10. Compliance in Specimen processing and Examination of thick film by laboratory technologists

	Frequency		Percentage %	
	Non-compliance	Compliance	Non-compliance	Compliance
The slide is whipped in the air to dry	60	25	71%	29%
Arrange specimens vertically in the drying rack	0	85	0%	100%
Immerse the slide into field stain A	16	69	18.8%	81.2%
Leave the slide for 7 seconds	16	69	18.8%	81.2%
Transfer Into water for 10 seconds	68	17	80%	20%
Place the film into undiluted field stain 'B'	16	69	18.8%	81.2%
Place in water for 10 seconds	17	68	14.1%	80.0%
Place vertically in the drying rack	16	69	12.9%	81.2%
Add drop of immersion oil into the slide	5	80	5.9%	94.1%
Examine by 100 power objective	0	85	0%	100%
Observe for 5 minutes	58	27	68%	32%
Enter result as soon as possible within 5 minutes	21	64	24.7%	75.3%
Place result for collection within 5 minutes	21	64	24.7%	75.3%

The table indicates general observation conducted among technologists who include two cadres of laboratory technicians and laboratory assistants' combined. On average technologists could not comply with observing the specimen under the microscope for minimum of 5 minutes, transferring of specimens into water for 10 seconds, and could not wipe the slide properly in expected time in the air. Observed 71% whipping specimens for less than 7 seconds.

4.2.4. Procedural compliance with specimen processing and examination

Two categories of laboratory personnel, namely; laboratory technicians and laboratory assistants were observed for each processing and examination procedure. The tables below show staff compliance for each procedure with high percentage of non-compliance which, probably contributed towards a high percentage, (average 73%) of specimens detected negative for malaria parasites.

Table 4.11. Whipping the slide in the air to dry

Category	Compliance		Non Compliance		Total
	Frequency	Percentage	Frequency	Percentage%	
Laboratory Technician	7	54%	6	46%	13
Laboratory assistant	18	25%	54	75%	72
Total	25		60		85

Table 4.12. Transferring the slide into water for 10 seconds

Category	Compliance		Non Compliance		Total
	Frequency	Percentage	Frequency	Percentage%	
Laboratory Technician	6	46%	7	54%	13
Laboratory assistant	12	16%	60	84%	72
Total	18		67		85

Table 4.13. Observing the specimen under microscope for not less than five minutes

Category	Compliance		Non Compliance		Total
	Frequency	Percentage	Frequency	Percentage%	
Laboratory Technician	4	30%	9	70%	13
Laboratory assistant	23	22%	49	68%	72
Total	27		58		85

The laboratory personnel have least complied with the following procedures;

- Whipping the slide in the air to dry;

- Transferring the slide into water for 10 seconds; and
- Observing the specimen under microscope for not less than five minutes.

It was observed that many laboratory personnel did not dry the specimens in the air accordingly, hence did not comply with the required norms for specimen drying. The specimens collected were processed without taking care whether the specimen was dry or not. Only 30% of laboratory technicians and 22% of laboratory assistants could wipe the specimen appropriately in the air to dry. Drying the specimens in the air helps fixation of the film to the slide so that the washing away of the film during soaking of the specimens into the field stain and then into the water is avoided. Washed specimens will leave only stains on the slide as there will be no blood film remaining for examination of malaria parasite and thus no parasite will be found. In this instance the result will be incorrect. (Cheesbrough.1998: 37).

Only 16% of laboratory assistants and 46% of laboratory technicians complied with the norms of transferring the slide into water for 10 seconds. The issue of concern is the time lapse for the soaking of the slide in order to have washed away excess stains for microscopic examination. Among the laboratory assistants 84% had not observed the required time for dipping the specimens into the water. The specimen was dipped for less than 10 seconds. Excessive stain on the specimen hinders correct viewing of the microscope for malaria parasites and hence incorrect reporting (Cheesbrough.1998: 37).

Laboratory personnel did not take enough time to examine specimens. Non-compliance was about 70% for laboratory technicians and 68% for laboratory assistants. Most of them used one or two minutes instead of the recommended five minutes or more to observe the specimen. Probable reason for such observation was due to time factor. Personnel in laboratory always have different and many tests to perform within a given

time. Few staff members in the establishment made laboratory work difficult. Slide examination is done not only for finding out malaria parasites but also for finding out other blood pathology, such as pathological white blood cells and red blood cells. Observing the specimen for a specified time will increase the possibility of finding parasites and capturing any other blood pathologies.

The study indicated that among 85 specimens involved in this research only 23 an equivalent to 27% were detected positive for malaria parasites, while 62 specimens which is equal to 73% were negative. However negative cases were also treated using anti- malaria therapy based on clinical presentations in combination with other therapy for other diseases diagnosed. Probably laboratory personnel need special training and periodically refresher training on specimen handling and processing. In addition to the training, special Checklist guidelines should be prepared and posted in different blood collecting points to remind health personnel on procedural norms.

4.3. SUMMARY

Staff nurses, trained nurses, laboratory technicians; and laboratory assistants took part in the study. Specimens were collected as follow: 9 by Staff nurses; 33 by trained nurses; 43 by Laboratory technologists. The information obtained shows that non-compliance was observed with all who cadres participated in the study. The laboratory personnel did not complied with the following; washing of hands before and after specimen collection; wiping the first drop of blood; putting specimens immediately in the transporting tray to the laboratory; taking the specimen collected to the laboratory within 30 minutes; and covering the transporting tray of the specimens to avoid contamination. Only two among health worker involved in the study managed to cover the specimens transporting tray to

avoid contaminations. The study indicated that among 85 specimens involved in this research only 23 specimens an equivalent to 27% were detected positive for malaria parasites, while 62 specimens an equivalent of 73% were negative.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSION

5.1.1. The level of compliance of health personnel in handling and processing of malaria blood specimens from patients in Tanzania.

The findings obtained show the highest percentage of non-compliance was observed in: washing the hands for specimen collection (91%); whipping the first drop of blood (63.5%); putting specimens immediately in the transporting tray to the laboratory (65.9%); taking the specimen collected to the laboratory within 30 minutes (77.6%); and covering the transporting tray of the specimens to avoid contamination (97%). Among health care workers involved in the study only two of them managed to cover the specimen-transporting tray to avoid contamination. The laboratory technologists have least complied with the following procedures; whipping the slide in the air to dry (71%); transferring the slide into water for 10 seconds (80%); and observing the specimen under microscope for not less than five minutes (68%). Only 16% of laboratory assistants and 46% of laboratory technicians complied with the norms of transferring the slide into water for 10 seconds.

Laboratory technologists did not take enough time to examine specimens. Non-compliance was about 70% for laboratory technicians and 68% for laboratory assistants. Most of them used one or two minutes instead of the recommended five minutes or more to observe the specimen.

The study indicated that among 85 specimens involved in this research only 23 specimens an equivalent of 27% were detected positive for malaria parasites, while 73% were negative. This shows that all 85 patients provisionally diagnosed for malaria and blood specimens collected and taken to laboratory for confirmation of the diagnosis 73% ended up with negative malaria result, even though clinically presented with typical malaria symptoms. While only 23% confirmed positive. The results indicate that 73% (almost $\frac{3}{4}$) of malaria cases could not be confirmed through laboratory investigations in spite of the typical symptoms presented. The follow up of all 62 patients (73%) with typical symptoms, indicate that were treated with anti malarial and recovered from the illness.

5.1.2. The competence of health workers in collecting, preparing, processing and investigating the malaria blood specimens.

All staff showed similar problems in specimen handling and processing these included: Washing hands for specimens' collection; whipping first drop of blood; putting specimens immediately in the transporting tray for transporting to the laboratory; covering the transporting tray to avoid contamination. Trained nurse and laboratory technologist were high on non- compliance in the in washing the hands; wiping the first drop of blood; putting specimens immediately in the transporting tray for transporting to the laboratory; and covering the transporting tray to avoid contamination. Only two-trained nurse had washed hands prior to specimen collection, while only one trained nurse and one laboratory technologist had covered the specimen's transporting tray.

It was observed that many laboratory personnel had poor understanding of the importance of drying the specimens in the air accordingly; hence these did not comply with the required norms for specimen drying. The specimens collected were processed without taking care whether the slide was dry or not. Only 30% laboratory technician and 22% laboratory assistants dried slide before proceeding with the tests.

Another issue of concern is the time lapse for the soaking of the slide in order to wash away un required stains for microscopic examination. Among the laboratory assistants 61% showed lack of competence in timing, and had not observed the required time for dipping the specimens into the water. The specimens were simply dipped in the water and removed. The majority of laboratory personnel followed almost all procedural norms for microscopic examinations. This indicates that laboratory technicians and Laboratory assistants complied with the microscopic examination procedures. The problem might be the time involved in examining bulk blood slides.

5.1.3 The Comparison between the clinical diagnosis and the laboratory results for confirming malaria.

The study indicated that among 85 specimens involved in this research only 23 specimens equivalent to 27% were confirmed positive, while 62 specimens equivalent to 73% were negative contrary to the provisionally diagnosed malaria by medical practitioner based on clinical presentations.

5.1.4.Guidelines for handling and processing of blood specimens for malaria parasite in Tanzania

Due to incompetence of health personnel in detecting the malaria parasite observed in the research, special checklist guidelines are proposed and being prepared. The proposed checklists guidelines are recommended also to be posted in different blood collecting and examining points to remind health personnel on procedural norms. Due to the high rate of non-compliance observed, the proposed guidelines for this essential test were designed based on international standard procedures. The method of field stain, which is recommended, has been taken into account during the construction of the guidelines, **(see annexure C)** for proposed checklist guidelines.

5.2. RECOMMENDATIONS FOR IMPROVEMENT OF HANDLING AND PROCESSING OF BLOOD SPECIMENS

Based on the findings that high percentage of non compliance observed among personnel in handling and processing of malaria blood specimens from patients, then recommendation based on this research include improvement of education and training in terms of enhanced in- service training and refresher courses on important issues on handling and processing of blood specimens for the diagnosis of malaria parasite. There is need for constant service supervision and day to day health education by senior health professional such as heads of laboratory section or nurse in charges of the wards or clinics to sensitize the health workers on the importance of adhering to policy and procedure for collection of blood specimen, transporting to the laboratory, processing of the specimen, microscopic examination, recording and feedback to the patient. Regular supervision by senior personnel on adherence to policies and procedure should be

ensured. Adherence to policy and procedures for diagnosis of malaria could be improved at the health care settings by reducing workload by ensuring adequate laboratory technologist patient ratios according to international standards. The following are also recommended:

- Special checklist guidelines should be established to guide the health personnel in handling and processing of specimen for the malaria parasites.
- Malaria parasites are high during the peak of the temperature whereby the parasites are released by the red blood cells. It is recommended that blood should be collected when the patient reports high fever, even without doctor's permission.
- There is need to give authority to admitting nurses to collect specimens on admission. The procedure should be routine to avoid malaria complications.
- The hospital management should plan for every year refresher courses to be conducted for personnel responsible for specimen handling and processing in order to keep them abreast on the required norms and providing them with new developments in the field.
- Health personnel need to be reminded by senior staff such as heads of sections on the importance of observing required procedures to ensure quality results.
- Special malaria quality assurance system needs to be established, whereby external and internal quality assurance activities established to ensure that unnecessary errors are reduced and results produced are accurate.
- Frequent supervision by senior staff can assist to improve the level of compliance

5.3. RECOMMENDATIONS FOR FURTHER STUDY

Materials, equipments and reagents are needed for proper handling and processing of blood specimens. To ensure quality of the result there is need to study the adequacy and evaluate the availability and validity of material, reagents, measurement and examination equipments.

5.4 SUMMARY

Generally, health personnel were not competent in handling and processing of specimen and had not complied with most of the norms in handling and processing of malaria blood specimens from patients. All categories of staff who participated showed that they were not competent in specimens handling and processing. Laboratory technicians and Laboratory assistants are not competent with microscopic examination. The problem might be related to the time involved to examine bulk blood slides. Similarities observed is that only 23 specimens equivalent to 27% were detected positive similar to the provisional diagnosis for malaria parasites, the rest 73% were different indicating negative results. Attached with this study is proposed guideline for malaria specimens handling and processing. It is recommended that education and training of health care workers should be improved through in service training for all cadres of staff that handle and process specimen. Constant supervision in handling and processing of blood specimens for malaria parasites is necessary.

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