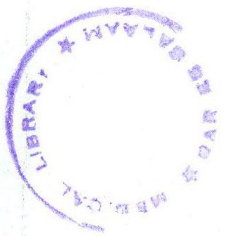
# PERFORMANCE INDICES OF CLINICAL PALLOR AND HEALTH WORKERS ADHERENCE TO THE IMCI GUIDELINES IN THE DETECTION OF ANAEMIA AMONG CHILDREN IN MKURANGA DISTRICT, COAST REGION, TANZANIA.

By

OTILIA FLAVIAN GOWELLE MD (Dar)

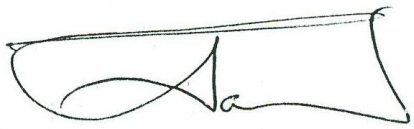
A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN THE UNIVERSITY OF DAR ES SALAAM.




2004

## CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the University of Dar es Salaam a dissertation titled "PERFORMANCE INDICES OF CLINICAL PALLOR AND HEALTH WORKERS ADHERENCE TO THE UTILIZATION OF IMCI GUIDELINES IN THE DETECTION OF CHILDREN WITH ANAEMIA IN MKURANGA DISTRICT, TANZANIA." in partial fulfillment of the requirements for the degree of Master of Public Health

SUPERVISOR'S SIGNATURE: 

Dr Donath S Tarimo MD (Dar) MSc (Dar), PhD (Copenhagen)

Date 15th October 2004

## STATEMENT OF COPYRIGHT

## DECLARATION

I hereby declare that, this dissertation is my original work, and that neither the whole nor parts of the dissertation have ever been submitted for a diploma or degree in any other University in partial fulfillment of the requirements for the degree of Master of Public Health.

Candidate's signature: _____

O.F.Gowelle, MD (Dar)

Date 15th October 2004

## ACKNOWLEDGEMENT

I would like to convey my sincere gratitude to the Ministry of Health (Tanzania), in collaboration with the World Bank, for their sponsorship, which enabled me to participate in this course.

I wish to thank all the academic staff of the School of Public Health and Social Sciences, Muhimbili University College of Health Sciences, Dar es Salaam, Tanzania.It was from them, that the foundation of this work grew.

I take this opportunity to express my sincere gratitude to my supervisor, Dr.Donath Tarimo, of the department of Parasitology and Medical Entomology, for his interest and commitment in providing invaluable advice and guidance in writing this dissertation.
I have benefited immensely from his constructive criticisms.

My heart felt regards go to Dr Ayubu Shekhkimweli, an acting District Medical Officer of Mkuranga district for his assistance in logistics arrangement during data collection. Ms Mary Roman, a nurse officer at the hospital who assisted in data collection and Mr Richard Palu, a district laboratory technologist who assisted me in the laboratory work and all the staff members of the Mkuranga district hospital, health centers and dispensaries for their co-operation.

Most of all I would like to convey my thanks to the mothers and care takers of the children that allowed me to include their children in this study. Last but not least, I wish to pay my very special tribute to my family: my beloved husband Leonard, for his love, moral support and understanding and my loving children Enita and Augustine, for tolerating my partial negligence of their care during the whole period of the course.

It will not be easy to mention every individual by name for all those who contributed in one way or another to the success of this work. I say thanks to everybody who assisted.

## ABSTRACT

Childhood anaemia is a major public health problem in African countries that are also holoendemic for malaria. In most of the peripheral health facilities in these countries, health workers rely on physical signs and not laboratory tests to detect anemic children who may need efficacious antimalarial drugs or referral for blood transfusion

A cross- sectional study was conducted during the period of June to July 2004, to assess the performance indices of pallor of the conjunctiva, nail bed and palms for the detection of anaemic children who should receive an antimalarial drug and those who should be referred for blood transfusion. The study also assessed health workers adherence to the IMCI guidelines for the detection of anaemic children.

A total of 274 sick children aged 2 to 59 months were evaluated for clinical pallor at the three anatomical sites. The presence of pallor was compared with the measured haemoglobin concentrations and the level of parasitaemia. A total of 26 health workers were interviewed and observed for their performance and adherence to the IMCI guidelines for the detection of anaemic children.

Overall, the prevalence of anaemia (haemoglobin < 11.0 g/dl) was 84.7%; severe anaemia (haemoglobin < 5.0 g/dl) was found in 6.2% of the children. The presence of

some pallor was associated with mild and moderate anaemia (haemoglobin <11.0g/dl) and could be detected with sensitivities of 78%, 80% and 75% respectively in the conjunctiva, nail bed and palms. Definite / severe pallor was detected in 5.8% of the children with a sensitivity 73% and specificity of 96% for the detection of severe anaemia (haemoglobin < 5.0g/dl). The prevalence of malaria parasitaemia of any level was 80%. The presence of some pallor had a sensitivity of 65% and specificity of 43% to detect malaria parasitaemia of any level. Definite / severe pallor had a very low sensitivity (11.0%) but a very high specificity for the detection of children with any level of parasitaemia.

Most of the health workers had adequate knowledge (100%) and skill (95%), however they lacked the skill for assessing general danger signs compatible with anaemia, 75% had poor performance. The time health workers spent with children was very short (8 minutes) and with mean workload of 29 patients per day.

This study has further validated that pallor is a feasible and reliable clinical sign for the detection of anaemic children who should receive an antimalarial drug and those who should be referred for blood transfusion. Most health workers in Mkuranga district are knowledgeable of the IMCI guidelines and have adequate performance in the use of IMCI guidelines for the assessment of children with mild to moderate anaemia but however they need re-training in the evaluation of dangers signs compatible with severe anemia.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| **ARI** | Acute Respiratory Infection |
| **AMO** | Assistant Medical officer |
| **BS** | Blood slide |
| **CDC** | Center for Disease control |
| **CI** | Confidence Interval |
| **COTC** | Clinical Officers training Center |
| **CO** | Clinical officer |
| **DSM** | Dar es Salaam |
| **Hb** | Haemoglobin |
| **IDA** | Iron Deficiency Anaemia |
| **IMCI** | Integrated Management of Childhood illnesses |
| **MCCHP** | Mkuranga Council Comprehensive Health Plan |
| **MCH** | Maternal and Child Health Clinic |
| **MUCHS** | Muhimbili University College of Health Sciences |
| **PHN 'B'** | Public health nurse B |
| **RCHS** | Reproductive and Child Health Services |
| **UNICEF** | United Nations Children Fund |
| **WHO** | World Health Organization |

# CHAPTER ONE

## 1 INTRODUCTION

### 1.0 Global overview of anaemia

Childhood anemia is a common public health problem, affecting one half to three quarters of pre school children, and accounting for more than half of hospital pediatric mortality in some areas with intense malaria transmission in sub Saharan Africa (WHO/ IMCI Bulletin: 1995). To combat this problem, the World Health Organization (WHO) is implementing new strategies for the integrated management of the sick child in the primary care setting, which includes algorithms based on clinical signs detected by trained professional health care workers. As part of these algorithms palmar pallor is used for the detection of anemia in the absence of routine hemoglobin (Hb) measurement .The initial focus of the WHO and UNICEF has been on the use of the algorithm by health care workers in health facilities, however, early recognition of moderate to severe anemia by primary care givers is essential so as to ensure that these children are brought early to the formal health care system (Desai et al, 2002). The World Health Organization and UNICEF have formulated generic case management guidelines in the form of charts and related course materials, and these have been found to be appropriate in the majority of developing countries where infant mortality rate is higher than 40 per 1000 live birth, including where there is intense transmission of *Plasmodium falciparum* malaria. (Luby et al .1995)

The WHO definition of anaemia in developing country is Haemoglobin level of 11grams/dl or less and is severe anaemia if the level falls bellow 7 grams/dl. However for Tanzania, is considered as severe anaemia when haemoglobin level is 5grams per dl or less. (MoH, 1999.Unpubl. obs)

## 1.1 CAUSES OF ANAEMIA

Anemia is not a specific entity but an indication of an underlying pathologic process or diseases. Although any reduction in hemoglobin concentration from normal decreases the oxygen – carrying capacity of the blood, the clinical sign of pallor becomes evident in skin and mucous membranes only when the level falls bellow 7 – 8 g/dl. (Lulu et al, 2000)

The main cause of anemia is Iron deficiency. Both Iron deficiency and anemia have profound negative effects on human development, including increased maternal and newborn mortality, impaired health and development of infants and children, limited learning capacity, impaired immune function and reduced working and reproductive capacity. Iron deficiency anemia is thus a major impediment to individual and national development.

Iron deficiency affects nearly more than 3.7 billion people worldwide and over 40% of this have clinical Iron deficiency. An estimated 58 % of pregnant women in developing countries are anemic with the results that their infants are more likely to be born with low birth weight and depleted Iron stores hence will get anemia of

early infancy. Available data showed that 31% of children under five years of age in developing countries are anemic, most of this being due to Iron Deficiency Anemia (IDA).Malaria is another leading cause of anaemia in developing countries mainly in the tropics and this is due to the hemolysis of red blood cells in already preexisting iron deficiency anaemia.

The main causes of such a high magnitude of IDA are low dietary intake of iron and poor bioavailability of dietary iron, followed by infections and intestinal parasitic infestations. Several other indirect causative factors such as poverty, poor infant feeding practices illiteracy and ineffective food policies that lead to low intake of iron are also associated with IDA (WHO Report, 2002)

In the WHO regions, the prevalence of anemia in Africa is 38.8%, America is 18 %, South –East Asia 52.7%, Europe 9.2%, Eastern Mediterranean 38.5 %; Western Pacific 38.4 % the mean global situation of anemia being 34.3 %. In these studies iron deficiency anemia was shown to be the leading type of anemia in all the regions with about 75% of the anemic population being iron deficient. (WHO: 2002)

The major types of childhood anemia are nutritional anemia of infancy, iron deficiency anemia, hemolytic anemia mainly due to the haemoglobinopathies such as Sickle cell disease, enzymatic diseases like G – 6 –P dehydrogenase deficiency

and malaria. Anemia of chronic infections such as hookworm is also common and this gives a peripheral blood picture of Iron deficiency anaemia.

Regardless of the type and cause of anemia, all patients will present with the sign of pallor in mucous membranes, nail bed and skin. Most of the first level health facilities in developing world such as dispensaries and health centers cannot do laboratory diagnosis of any of the above causes and others have no laboratory facilities for the diagnosis of anaemia hence clinicians rely on clinical diagnosis for decision making on the management, therefore, clinical diagnosis remain the solely means of diagnosis so as management can be instituted. Patients with moderate anemia are given iron treatment at the clinic with nutritional advice while those who will be severely anemic are referred to hospitals for investigations and if possible blood transfusion.

## 1.2 BACKGROUND OF IMCI STRATEGY

Each year more than 10 million children in low-and middle-income countries die before they reach their fifth birthday. Seven in ten of these deaths are due to just five preventable and treatable conditions namely pneumonia, diarrhoea, malaria, measles, and malnutrition, and often to a combination of these conditions (Kalter et al. (1997).

Every day, millions of parents seek health care for their sick children: taking them to hospitals, health centres, pharmacists, doctors and traditional healers. Surveys reveal that many sick children are not properly assessed and treated by these health care providers, and that their parents are poorly advised. At first-level health facilities in low-income countries, diagnostic supports such as radiology and laboratory services are minimal or non-existent, and drugs and equipments are often scarce. Limited supplies and equipments, combined with an irregular flow of patients, leave doctors at this level with few opportunities to practice complicated clinical procedures. Instead, they often rely on history, signs and symptoms to determine a course of management that makes the best use of the available resources. These factors make providing quality care to sick children a serious challenge. WHO and UNICEF have addressed this challenge by developing a strategy called Integrated Management of Childhood Illness. (WHO/ IMCI 1995)

The IMCI strategy is an integrated approach to child health that focuses on the well being of the whole child. The IMCI strategy aims to reduce death, illness and disability and to promote improved growth and development among children under 5 years of age and includes both preventive and curative elements that are implemented by families and communities as well as by health facilities. Children brought for medical treatment in the developing world are often suffering from more than one condition, making a single diagnosis impossible. IMCI is an integrated strategy, which takes into account the variety of factors that put children

at serious risk and ensures the combined treatment of a major childhood illnesses (WHO/ IMCI 1995).

## 1.3 THE MAGNITUDE OF THE PROBLEM IN TANZANIA

Tanzania is faced by high prevalence of preventable diseases that commonly give a big impact to children under five years of age. Such diseases includes acute febrile illnesses due to malaria, acute respiratory infections (ARI), measles malnutrition and anaemia addressed by IMCI strategy .The prevalence of anaemia in the country is 32%; for under five the prevalence is 20% The prevalence is higher in the rural settings where diagnostic facilities are scarce making health workers to rely on clinical signs for the diagnosis of anaemia. (MOH Abs.1999)

## 1.4 OVERVIEW OF IMCI IMPLEMENTATION IN TANZANIA

The country has adopted the IMCI strategy since 1996, the aim being to reduce prevalence of IMCI addressable diseases and ultimately reduce mortality due to these diseases, by strengthening case management and improve on drugs and supplies in all primary health care facilities.

Seven districts were involved as pilot districts, in the implementation phase where by health workers were trained on clinical skills .The districts were Magu, Igunga, Morogoro rural, Rufiji, Muheza, Mpwapwa and Korogwe.

After the first two years of implementation in the seven districts, 50% health workers were trained 60% of health workers were followed up at least once. Follow up after training was found to be not efficient because only 7.5 % of the workers were followed twice. (Anonymous: RCHS 2003). The programme was later expanded within the districts, to other districts within the regions, to new regions, to Zanzibar, to pre – service institutions and to refugee camps in October 1997.

**Current status of IMCI implementation in Tanzania**

**First component**

In service 90% of the districts are at different levels of implementation and 50% have started including IMCI in their annual comprehensive health plans. Training of health workers in refugee camps is going on, over 1973 health workers have been trained and over 70% have been followed up at least once.

The HWs were trained under different schedules some for 11 days and others for 15 days. The first groups were trained in English and then after adaptation they were trained in Swahili. The use of different training schedules and language may conceivably lead to different levels of performance by health workers.

Pre service: Three clinical officers and two AMO schools, Mbeya AMO School, Bugando AMO School, Kibaha COTC, Songea COTC, and Mafinga COTC, were pilot institutions for IMCI training. To date all the AMO schools, more than 90% of COTC and all the schools of Nurse Tutors and Nursing schools are involved in IMCI. Tutors from these centers were trained to teach IMCI in their respective schools the IMCI programme having been incorporated in their curriculum. The IMCI programme is also incorporated into the curriculum of graduate medical students.

**Second Component**

The District indent system aims to ensure that drugs are ordered according to their needs. In the EDP kit system for all dispensaries, parenteral Quinine and Chloramphenical to be available up to dispensary level as pre referral drugs.

**Third component**

Household survey for community IMCI has been done in seven districts to assess key childcare practices in the country. Analysis of which facilitated the development of communication strategies and tools for improving child care practices and have been implemented by several Districts including Mkuranga.

## 2 STATEMENT OF THE PROBLEM

Anaemia is common childhood health problem in malaria endemic areas including Tanzania. In such areas quite often mild and moderate anaemia may rapidly progress to severe anaemia that needs blood transfusion, and in a number of cases end up with a fatal outcome (Mabeza. 1998). In most of rural areas of Tanzania where malaria is endemic there are no facilities for microscopic confirmation of severe malaria and there are no equipments for haemoglobin estimation so as to timely detect children with severe anaemia (Tarimo et al 1999). The use of clinical pallor could however detect children with severe malaria and moderate to severe anaemia who should receive antimalarial drugs, haematenics and blood transfusion respectively (Tarimo et al 1999).

Palmar pallor by itself is the least accurate in the detection of severe anaemia, but in combination with nail bed pallor improves sensitivity up to 50 - 56% (Lulu et al 2000). Leaving behind 44 – 50% of the children with severe disease. Although pallor is included in the IMCI algorithm; different studies have shown different sensitivity and specificity for diagnosing anaemia. In most of the studies to evaluate performance of health workers at a primary setting, feedback was given immediately during observation. Therefore performance could be much lower compared to what is known. (Desai et al 2002, Odhacha et al 1998, Pambala M et al, 1998)

Training Health workers on IMCI is either during in-service or pre service. These trainings are of different duration, and different languages are used. Therefore performance may be different and standard jeopardized.

The problem of not correctly diagnose and provide correct treatment to under fives is enormous, such that 69%of children with severe disease were wrongly classified and 68% of them were wrongly treated immediately after training .The trend was found to be increasing in managing anaemia. (Odhacha et al 1998)

**2.1 Research Questions: This study aimed to address the following questions**

What is the accuracy of palmar pallor in diagnosing moderate and severe anemia in a Tanzanian Primary clinical setting?

How does the performance of palmar pallor compare with nail bed and conjunctival pallor in the detection of children with anaemia?

Do health workers systematically examine children for the danger signs compatible with severe anaemia in children?

After the in – service training of health workers on the IMCI guidelines for detection of children with anaemia, how are they performing?

Why do health workers fail to use IMCI guidelines for the detection of children with anaemia after training?

## 3. THE RATIONALE OF THE STUDY

Clinical pallor is recommended as a simple way to detect anaemia in children in peripheral health facilities without facility for haemoglobin levels estimation .The IMCI guidelines only use palmar pallor for the detection of children with anaemia, but the accuracy of the strategy for the diagnosis moderate and severe anaemia is not fully documented. Like wise, health workers adherence to the IMCI guidelines for the detection of anaemia in children needs to be updated following their previous training on IMCI and supervisory visits. Therefore the study will explore the magnitude of the problem among the health workers in terms of not been able to use the guidelines in spite of the training received.

Furthermore it is not fully known as to whether incorporation of nail bed pallor and conjunctival pallor will improve the diagnostic accuracy for anaemia in children. The rationale of this study therefore was to update the health workers performance on the use of the IMCI algorithms for the systematic assessment of the sick child and detection of anaemia in such children; and to assess whether inclusion of nail

bed and conjunctival pallor in addition to palmar pallor would improve the diagnostic accuracy of anaemia in children.

To the best of our knowledge this study has not been done in Tanzania, although it has been done in Bangladesh, Kenya, Uganda and Ethiopia and Malawi. Therefore; these data will enable the planning of further in – service training for the health workers so as to improve child health care in the districts

## 4. OBJECTIVES

### 4.1 BROAD OBJECTIVE

To assess the performance indices of pallor and health workers performance on utilization of IMCI guidelines, for the detection of children with anaemia in, Mkuranga district.

### 4.2 SPECIFIC OBJECTIVES

1) To assess knowledge of health workers regarding IMCI algorithms for Management of anemia.
2) To assess health workers' performance on the use of the IMCI guidelines for the detection of children with anaemia.
3) To assess health workers performance on the IMCI guidelines for the detection of children with danger signs compatible with severe anaemia.

4) To assess the performance indices of palmar, nail bed and conjunctival pallor for the detection of children with anaemia.

5) To assess the performance indices of pallor for the detection of children with a laboratory confirmed malarial disease.

6) To assess whether the workload of the health workers influence their adherence to the IMCI guideline for managing sick children.

# CHAPTER TWO

## 5. LITERATURE REVIEW

The IMCI strategy has been implemented in many developing countries by incorporating it into the national health care programs but still little is known about health workers performance after IMCI training .To measure the level of performance achieved and maintained by the IMCI –trained health workers during 1996 – 1997 CDC, the Kenya- Finland primary Health Care Program and the Ministry of Health of Kenya, prospectively evaluated the level of performance achieved by IMCI - trained Health workers at the end of training and the level of performance maintained during the first 3 months post training with monthly and bimonthly clinical supervision (Odhacha et al 1998).The results showed that performance was high for managing children with mild and moderate diseases but performed at a much lower level when managing severely ill children.

The supervisors used checklists to record the care provided to children aged 2 – 59 months, and provided feedback immediately after finishing. However this feedback could have made the health workers change their practice and reduce the magnitude of the problem. Due to this feedback only the first children seen were included in the study hence reducing sample size and because in this study children with severe disease were few therefore all of those who showed up were included in the study. This method was adapted as an opportunity because the situation was similar in this

study. In this study overall higher performance was for classifying and treating mild and moderate diseases and considerably very low performance for classifying (31%) and treating (32%) severe disease at the end of training and 24% correctly classified and 26% correctly treated after 3 months of follow up. Anemia was one of the diseases that health workers showed declining trends in performance (Odhacha et al.1998).

A study conducted by Lulu et al (2000) in rural health centers in Ethiopia for evaluation of clinical pallor in the identification and treatment of children with moderate and severe anemia showed that; the presence of any pallor clinically correlated with moderate anemia (hemoglobin level <8g/dl) could be detected with a sensitivity of 95% and specificity of 64 – 68 % when palm pallor and nail bed pallor was used, and sensitivity of 84% and specificity of 81 % when conjunctivae were used. These results showed that clinical pallor have high sensitivity and specificity in the diagnosis of moderate anemia. However, severe anemia was detected clinically as severe pallor in 50 – 56% of cases. This means of all the children who had hemoglobin < 5 g/dl the pallor could detect only 56 % of them leaving others 44 – 50% unidentified, therefore could not get the referral for the possible blood transfusion .The specificity (95 – 96%) of pallor to diagnose severe anemia was very high but because severe anaemia is life threatening, we need a clinical sign that is highly sensitive so as not to miss any child who needs blood transfusion. This means, of all those children who had no severe anemia, only 4 – 5

% were said to have severe anemia. But here specificity is not more helpful than sensitivity because referring children who are believed to be severely anemic while actually they are not, is not as fatal as leaving a severely anemic child at the facility only because of a wrong diagnosis contributed by a poor screening test. This shows that clinical diagnosis is not sensitive and imprecise in diagnosis of severe anemia. In the same study, the agreement between physicians was highest for use of conjunctivae and nail bed pallor for diagnosis of moderate and severe anemia (87%) and lowest for palmar pallor (75%).

Another study was conducted by Desai et al (2002), on recognition of pallor associated with severe anemia by primary care givers in Western Kenya; results showed that clinical diagnosis using pallor at any anatomical site was associated with sensitivity of 75.6% and specificity 63%. This indicates that primary care givers can recognize severe anemia that is Hb <5g/dl in their children but only with moderate accuracy because of low sensitivity; 34.5% of the severely anemic children will be left untreated which is very fatal. Moreover 37%of those who are not severely anemic will be classified as severely anemic by clinical diagnosis and being referred unnecessarily. Palmar pallor did not work as well as conjunctiva pallor in Bangladesh and Uganda that is 10% to 50% sensitive for severe anaemia however when in combination the sensitivity increased to 71% to 87% for moderate anaemia and it was recommended that conjunctiva pallor should be added to the

IMCI anaemia box or adapted in regions where palmar pallor may not readily be detected (Kalter et al 1997).

In a study in the Gambia clinical pallor was shown to be highly sensitive when used in combination between definite pallor of the conjunctiva and pallor of the palms with a sensitivity of 80% and specificity of 85% (Weber et al 1997). However in Western Kenya, severe palmar pallor and severe nail bed pallor were less reliable in the diagnosis of anaemia being only 53% sensitive and 59% specific (Lulu et al, 2000). In this study, clinical pallor in all anatomical sites was strongly associated with the presence of malaria parasitaemia hence the rationale for treating all anaemic children with effective antimalarial drug (Zucker et al 1997).

# CHAPTER THREE

## 6. METHODOLOGY

### 6.1 DESCRIPTION OF THE STUDY AREA.

The study was conducted in Mkuranga district; Coast region on the Eastern part of Tanzania.The region has a total of 6 districts namely Rufiji, Mkuranga, Kisarawe, Kibaha, Bagamoyo and Mafia. The major tribes being Wakwere, Wandengereko, Wamatumbi and Wazaramo, with a total population of 889,154 as per National census. The Mkuranga district is one of the new districts and was inaugurated on 1st July 1995, when the former Kisarawe district was divided into two districts; namely Mkuranga and Kisarawe .The district has a total of 2432 square kms, with 447 square kms covered by water (Indian Ocean), 52 square kms of forest reserve area and 1034 square kms of land suitable for cultivation.

Mkuranga experiences two rainfall seasons: short rains which start in October to December and long rains happen between months of March to June. The average rainfall is about 800 -1000 millimeters per annum. The rainfall distribution however is not very reliable within the seasons. More often, the short season experiences more variation than the long rain season's. It is hot throughout the year with average temperature of 28°centigrade.The district has two major agro – ecological zones which differs due to landforms as well as soil classification. These

zones are coast belt and upland area. The district is located between latitude 6°35" and 7°30" south of the Equator and between longitudes 38 ° 45"and 39 ° 30 to the East. It borders with the South and Kisarawe district to the West (MCCHP, 2003). It has a population of 186,927 people (Census report .2002) among whom 91,411 are males and 95,516 are females. About 87 % of the population is in the rural areas.

The district has 1 hospital owned by the government, 2 health centers owned by the government, 29 dispensaries where 20 of them are owned by the government and 9 of them are private or voluntary agency owned .The prevalence of anemia in the under five population in the district is 18% and is the third among the top ten diseases seen at the outpatient department diagnosis. The population of under five in the district is 28,490 children .The district has 2 medical officers, 3 Assistant medical officers, 24 clinical officers, 1 public health nurse 'A', 9 nurse officers and 16 public health nurse 'B'. More than 50% of the clinicians have been trained on IMCI case management. (MCCHP, 2003). The Mkuranga district is one of the new Districts in Tanzania and IMCI has been introduced recently year 2002, this was in the expansion phase of IMCI in Tanzania and in the same year community IMCI has been implemented.

**6.2 THE STUDY POPULATION.**

The study comprised of 3 study units,

1. Health workers, which were the clinicians from OPD and MCH clinics.
2. Sick Children aged from 2months to 59 months of attending MCH and OPD clinic.
3. Sick children admitted for severe anaemia.

### 6.3 STUDY DESIGN

This was a descriptive, cross – sectional study. Quantitative methods using questionnaires were employed for assessing knowledge of health workers with regards to IMCI guidelines and factors influencing the identification palmar pallor at a clinical setting. Observation for performance skills in assessment of a child for malnutrition and anemia was done using an observation checklist. A checklist for laboratory diagnosis of anemia and malaria for each patient against clinical diagnosis of pallor was used to obtain the data for performance indices of conjunctival, nail bed and palmar pallor assessed against haemoglobin level and malaria parasites as gold standard.

### 6.4 SAMPLING AND SAMPLE SIZE

The selection of the district was based on a simple random sampling method .The names of the 5 districts were written on flip chart (excluding Kibaha because the principal investigator works in the district), and then each district was given a number,

1, for Bagamoyo, 2, for Kisarawe, 3, for Rufiji, 4, for Mkuranga and 5, for Mafia Then the numbers were written in small pieces of papers and closed then were diced .A colleague was asked to pick one of them from the bowl, one of the 5 papers was picked and number 4 was chosen that stood for Mkuranga district on a flip chart.

## 6.5 SAMPLING AND SAMPLE SIZE FOR FACILITIES

The hospital and the two health centers were selected on convenience, because they are the only present in the district and 13 dispensaries by random selection.

## 6.6 SAMPLE SIZE OF HEALTH WORKERS

FOR INTERVIEW

The health workers were selected on random procedure, and clinical officers were selected for convenience due to their scarcity and they are the ones that make diagnosis. At the dispensary and the health centers, where more than two trained clinicians were present only two were selected randomly however when only one was present then conveniently he or she was recruited. At the hospital 7 clinicians were interviewed.

The health workers were interviewed using a questionnaire by the investigator and the research assistant, from all levels of service delivery.

At the council hospital out of 11 clinicians 7 of them were interviewed.

At each health center out of the 3 clinicians 2 of them were interviewed.At the dispensary level 1 provider was interviewed from each of them except for 2 dispensaries, one private another government where 2 clinicians were interviewed. Making a total of 26 clinicians. These Health workers were assessed on level of knowledge, of using the guideline to come out with the correct classification and correct treatment for anaemia.

## 6.7 SAMPLE SIZE AND SAMPLING OF HEALTH WORKERS FOR SKILL PERFORMANCE ASSESSMENT

The health workers who were making diagnosis and treatment were selected conveniently and this involved clinical officers, clinical assistants Prescribing nurse officers, public health nurse 'B' and nurse assistants at some facilities, from MCH and from OPD clinic of both the hospital, the health centers and 13 dispensaries. They were observed while treating the children aged 2 to 59 months and results recorded in the checklist. The observation was for at least 4 children. Of all interviewed clinicians only 20 managed to be observed while managing for sick children due to the fact that others did not have opportunity to be on duty during the period of the study.

## 6.8 SAMPLE SIZE OF CHILDREN

The sample size for estimation of children was calculated using the a random sampling formula, of sample size for estimation of proportion where as the estimated prevalence of anemia in Mkuranga district was set at 18% and the margin of error 0.05%.(MCCHP ,2003)

Thus using the formula,

$$N = \frac{(Z)^2\, p\,(100 - p)}{\varepsilon^2}$$

Where

N is the desired sample size,

P - Is the estimated proportion or prevalence of anemia among under fives in Mkuranga district which was set at 18% ± 5% (MCCHP, 2003)

ε - Is the margin of error of 'p', 0.05.

Z- Percentage of Standard normal distribution correspond to 95% confidence interval (95% CI, Z = 1.96)

$$N = \frac{(1.96^2) * 18 * (100 - 18)}{5^2}$$

$$= 227 \text{ children}$$

Plus 10% maximum attrition rate expected gave a sample of 250 children.

A total of 274 Children were seen in the study. This was 20.7% more than the sample size. A blood sample for hemoglobin concentration was taken after clinical assessment of pallor. Also blood slide for malaria was checked for each child and results recorded in the checklist.

A probability proportion sample basing on random selection was used: where as

50% of children were selected from hospitals,

25% of them from the health centers,

25% of them from the dispensaries.

The proportion at the hospital was high because it was expected to get more attendances for children due to a big catchment's area while at the health centers and dispensaries the catchment's area is low. Then all the children who attended at the OPD or the MCH clinic for medical care were conveniently included in the study as they were coming.

## 6.9 SAMPLE SIZE FOR CHILDREN AGED 2 – 59 MONTHS

All children aged 2-59 months admitted for severe anaemia at the time of the study were included in the study.

## 7. DATA COLLECTION METHODS AND TOOLS

The principal investigator (PI) collected the data with the research assistants, a Nurse officer (a senior facilitator in IMCI training and a district laboratory technologist.

### 7.1 Performance of pallor for the detection of children with mild to moderate anaemia and severe anaemia

A total of 274 children were sampled in hospital, health centers, and dispensary. The children were recruited as they were coming on outpatient attendance to the respective health facilities, at the period from 9.00 am to 3.30 pm. All were included in the study. The clinicians evaluated the children at the OPD and referred them to the laboratory technician who checked them, blood slide for malaria parasites and haemoglobin estimation. At the laboratory the PI re-evaluated the children for pallor at the three anatomical sites: conjunctiva, nail bed and palms. The findings from the OPD and that of the PI were recorded. The children were then examined for malaria parasites using Giemsa staining and haemoglobin level by using the Haemocue machine. Pallor was recorded as any /some pallor to indicate mild and moderate anaemia (Hb 5.1 - <11g/dl) and definite/severe pallor to indicate severe anaemia (Hb <5g/dl).

A total of 6 children admitted in the hospital for severe anaemia were included in the study. Case notes of these children were examined noting down the degree of pallor recorded at admission, the Hb level and B/S findings. The PI then assessed and recorded the degree of pallor.

**7.2 Health workers Performance assessment**

This was carried out by an observation checklist of systematic events in the IMCI algorithm that have to be followed in accordance to the IMCI guidelines for the evaluation of the sick child basing on pallor for the detection children with anaemia who should receive an ant malarial drug or be referred for blood treansfussion. The PI or research assistants sat in a consultation room noting down all the events until a clinical conclusion was achieved. Feedback was not provided during the observation unless a dangerous conclusion was entertained in which case the PI would give correct conclusion. Scoring as follows assessed performance:

**Excellent**; for those who followed 75% or more of the steps correctly

**Good;** for those who followed 74 – 50% of the steps correctly

**Poor;** for those who followed less than 50% of the steps correctly.

### 7.3 Knowledge assessment

A total of 26 HWs were included in the study; 7 from the hospital, 5 from the health centers and 14 from the dispensaries. Knowledge on the IMCI guidelines was assessed using a standard questionnaire (appendix 15.3) and the level of knowledge was scored as follow:

Excellent; if the H/W scored ≥ 75%

Good; if the H/W scored 50 - < 75%

Poor; if scored less than 50%.

### 7.4 Health workers workload

The PI and the research assistant checked at the registry book and recorded the total number of patients seen by each health worker during the day of observation.

## 8. DATA MANAGEMENT AND ANALYSIS

Pre testing of the tools was done at the Tumbi special hospital's RCH clinic in Kibaha District, Coast region. The pre testing took 2 days and it was one week prior to start of actual data collection. The tools were modified according to results of the pre testing.

Data was collected for 28 days, the research assistants were trained two days and within the same 2 days logistic arrangements were set. Supervission was done after every 2 days to see if data was collected as intended. The Questionnaires and Checklists were collected from the research assistant after every 2 days to monitor the trend of sample size and to avoid researcher bias to data manipulation.

Data were manually cleaned each day to ensure consistency of the responses; then were entered in a computer Epi info 2002.Further cleaning was done by the computer package followed by analysis. Eplorative analysis was carried out to assess the frequency of pallor, how malaria parasitaemia, frequency of the different grades of HWs performance and level of knowledge. The commonly used performance indices of screening tests such as sensitivity (SE), specificity positive predictive value (PPV) and negative predictive value (NPV) were calculated using the corresponding number of true positives (TP), true negatives (TN), false positives (FP) and false negatives (FN). The performance indices were calculated for pallor at each anatomical site and in combination for the detection of children with anaemia who should receive an antimalarial drug using Hb level and malaria parasitaemia as the gold standard.

## 9. ETHICAL CONSIDERATIONS

The research ethical clearance was obtained from MUCHS, School of public Health and Social Sciences. Before proceeding with data collection, permission from the District authorities was sought. Introduction at all levels of the authorities and the

in charges of each section of the facility was done before data collection. The in charges were explained on the aim of the study. Participants in the study were not asked for their names so as to appear on the questionnaire and checklists but the names of children had to appear for purpose of identifying the return visits for the same patients for the same illness. Consent from the interviewee, observed clinician and the care taker of the child while doing observation was sought and an informed consent was obtained from caretakers of the child before blood sample taken.

All patients who appeared to have Mild or moderate anemia by gold standard i.e. hemoglobin level of less than 11g/dl or more than 7 g/dl were given haematenics and antimalarial drugs from the routine dispensing pharmacy of the facility. Those requiring referral were referred as per available routine transport to the referral health facility that is the Council hospital.

## 10. STUDY LIMITATIONS

1. Laboratory technicians might have reported different results to favor clinical diagnosis because he could have seen the level of pallor in the notebook of the child.

2. IMCI Trained clinicians were attending workshops and others involved in the research activities during the study leaving untrained clinician at the facility therefore reducing the number of facilities to visit.

3. Clinicians might have changed their way of practice knowing that they are being observed.

# CHAPTER FOUR

## 11. RESULTS

### Assessment of pallor for the detection of children with anaemia and malaria parasitaemia

A total of 274 children aged 2-59 months were assessed for pallor and had their haemoglobin estimated and blood slide for malaria parasites checked. The age groups and sex distribution of the children included in the study is shown in Table 1.

**Table 1: Distribution of age group of children 2-59 months by their sex**

| Age group (In months) | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (% ) |
| 0-11 | 51 | (37.5) | 48 | (34.8) | 99 | (36.1) |
| 12-23 | 44 | (32.4) | 46 | (33.3) | 90 | (32.8) |
| 24-35 | 30 | (22.1) | 28 | (20.3) | 58 | (21.2) |
| 36-47 | 8 | (5.90) | 12 | (8.70) | 20 | (7.30) |
| 48-59 | 3 | (2.20) | 4 | (2.90) | 7 | (2.60) |
| Total | 136 | (49.6) | 138 | (50.4) | 274 | (100) |

Chi-square 0.03, P value 0.864 there is no significant difference between the males and females.

The majority of the children (89.1%) were in the age groups of 0-35 months, with a sex ratio of 1:1(male: female)

The prevalence of anaemia (Hb < 11.0g/dl) among children involved in the study is 84.7%.

**Table 2: Distribution of children with different levels of Hb by their age groups N=274**

| Agegroups (In months) | Degree of anaemia: Severe (Hb ≤ 5) n | % | Moderate (Hb>5 to 8) n | % | Mild (Hb>8 -<11) n | % | Noanaemia (Hb>11) n | % | Total n | % |
|---|---|---|---|---|---|---|---|---|---|---|
| 0-11 | 7 | (41.2) | 24 | (31.60 | 52 | (37.4) | 16 | (38.1) | 99 | (36.1) |
| 12-23 | 6 | (35.3) | 23 | (30.3) | 45 | (32.40 | 16 | (38.1) | 90 | (32.8) |
| 24-35 | 3 | (17.6) | 20 | (26.3) | 29 | (20.9) | 6 | (14.3) | 58 | (21.2) |
| 36-47 | 1 | (5.9) | 8 | (10.5) | 7 | (5.0) | 4 | (9.5) | 20 | (7.3) |
| 48-59 | 0 | (0.00) | 1 | (1.3) | 6 | (4.3) | 0 | (0.00) | 7 | (2.6) |
| Total | 17 | (6.2) | 76 | (27.7) | 139 | (50.7) | 42 | (15.3) | 274 | (100.) |

Over all 6.2% of the children had severe anaemia (Hb ≤ 5g/dl) and 27.7% had moderate anaemia (Hb >5 to ≤ 8 g/dl) and 50.7% had mild anaemia (Hb >8 to <11g/dl).

Majority of children (76.5%) with severe anaemia were in the age group 0 to 23 months.

Among the children with mild and moderate anaemia the age group 0-35 months was more affected by 89.8%

The severity of anaemia was less in children aged more than 36 months as only 1(5.9%) had severe anaemia and the proportion of mild and moderate anaemia was 10.2% among all who suffered.

**Performance indices for clinical pallor**

The prevalence of children with any/some pallor at the conjunctiva was 63.5% (CI 57.5%-69.2%), nail bed was 65.3 %( CI 59.4%-71%) and palms were 64.6% (CI 58.6%-70.3%). At all three sites the prevalence of anaemia was 49.6%. The prevalence of definite/severe pallor at the conjunctiva was 10.6 %( CI 7.2%-14.8%), nail bed was 6.6% (CI 3.9%-10.2%) and at the palms were 6.6 %( CI 3.9%-10.2%). At all three sites the prevalence of severe anaemia was 5.8%.

The mean haemoglobin of children with any/some pallor at conjunctiva was 8.54g/dl, SD 1.44, nail bed 8.38g/dl, SD 1.52, palms 8.62g/dl, SD 1.73 and at all three anatomical sites 8.49g/dl, SD 1.09. While the mean Hb of children with definite /severe pallor at conjunctiva was 5.18g/dl, SD 1.11, nail bed was 14.96g/dl, SD 1.36 palms 5.22g/dl, SD 1.62.And at all three anatomical sites was 4.79g/dl, SD 1.09.The mean haemoglobin of children with no pallor at the conjunctiva was 10.79g/dl, SD 1.61,nail bed 10.55g/dl, SD 1.89,palms 9.90g/dl,SD 2.10 and at all three sites 10.96g/dl,SD 1.25. All the children with: any/some conjunctiva, nail bed, palmar and those with any/some pallor at all the three sites had significantly lower mean Hb than those without some pallor (p value=0.0000). Also all the children with: definite/severe conjunctiva, nail bed, palmar and those with definite/severe pallor at all the three sites significantly lower mean Hb than those without severe/definite pallor (p value=0.0000).

**Table 3: The relationship of mild and moderate anaemia (Hb>5 to <11g/dl) with some conjunctiva pallor (N=274)**

| Conjunctiva pallor | Hb (>5to<11g/dl) | | Hb (<5and>11g/dl) | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | ( %) |
| Some | 167 | (77.7) | 7 | (12.0) | 174 | (63.5) |
| Not some | 48 | (22.3) | 52 | (88.0) | 100 | (36.5) |
| Total | 215 | (78.5) | 59 | (21.5) | 274 | (100.0) |

Chi-square 168.6, P value0.0000

The presence of some conjunctival pallor was significantly associated with mild and moderate anaemia.

**Table 4: The relationship of Severe anaemia (Hb ≤ 5g/dl) with definite /severe conjunctival pallor. (N=274)**

| Conjunctival pallor | Hb (≤5g/dl) | | Hb (>5g/dl) | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | ( %) |
| Definite/Severe | 14 | (82.4) | 15 | (5.80) | 29 | (10.6) |
| No definite | 3 | (17.6) | 242 | (94.2) | 245 | (89.4) |
| Total | 17 | (6.20) | 257 | (93.8) | 274 | (100.0) |

Chi-square 231.3, P-value = 0.0000

The presence of definite /severe conjunctival pallor was highly significantly associated with severe anaemia.

**Table 5: The relationship of severe anaemia (Hb ≤5g/dl) with definite nail bed pallor (N=274)**

| Nail bed pallor | Hb ≤5.0g/dl | (%) | Hb >5.0g/dl | (%) | Total n | (%) |
|---|---|---|---|---|---|---|
| Definite/Severe | 12 | (70.6) | 6 | (8.4) | 18 | (6.6) |
| Not definite | 5 | (29.4) | 251 | (91.6) | 256 | (93.4) |
| Total | 17 | (6.2) | 257 | (93.8) | 274 | (100.0) |

Chi Square 91.6, P value 0.0000

The presence of definite /severe nail bed pallor was highly significantly associated with severe anaemia.

**Table 6: The relationship of Mild and Moderate anaemia (Hb >5-<11g/dl) with some nail bed pallor (N=274).**

| Nail bed pallor | Hb (>5to<11g/dl) | | Hb (<5and>11g/dl) | | Total | |
|---|---|---|---|---|---|---|
| | n | ( %) | n | (%) | n | (%) |
| Some | 172 | (80.0) | 7 | (11.9) | 179 | (65.3) |
| Not some | 43 | (20.0) | 52 | (88.0) | 95 | (34.5) |
| Total | 215 | (92.7) | 59 | (7.3) | 274 | (100.0) |

Chi-square 196.3, p value 0.0000

The presence of any/some nail bed pallor was significantly associated with mild and moderate anaemia.

**Table 7: The relationship of severe anaemia (Hb <5g/dl) with definite/severe palmar pallor (N=274)**

| Palmar pallor | Hb ≤ 5.0g/dl | (%) | Hb >5.0g/dl | (%) | Total n | (%) |
|---|---|---|---|---|---|---|
| Definite/Severe | 11 | (64.7) | 7 | (2.7) | 18 | (6.6) |
| Not definite | 6 | (35.3) | 250 | (97.3) | 256 | ( 93.4) |
| Total | 17 | (6.2) | 257 | (93.8) | 274 | (100.0) |

Chi-square 46.7, p value 0.0000

The presence of definite /severe palmar pallor was highly significantly associated with severe anaemia.

**Table 8: The relationship of Mild and Moderate anaemia (Hb >5 to <11g/dl) with some palmar pallor (N=274).**

Degree of anaemia

| Palmar pallor | Hb (>5to<11g/dl) | | Hb (<5and>11g/dl) | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) |
| Some | 162 | (75.0) | 15 | (25.4) | 177 | (64.6) |
| Not some | 53 | (25 .0) | 44 | (74.6) | 97 | (35.4) |
| Total | 215 | (92.7) | 59 | (7.3) | 274 | (100.0) |

Chi-square 139.0, p value 0.0000

The presence of some palmar pallor was significantly associated with mild and moderate anaemia.

The performance indices of pallor at different anatomical sites was then computed, the anatomical sites being the conjunctiva, nail bed and palms. Then it was computed to see the performance indices at all the three anatomical sites. Sensitivity and specificity of some pallor and definite/severe pallor (see definition of terms appendix 15.5) were computed against the haemoglobin levels. The gold standard for some pallor is Hb level of 55.1to less than 11.0g/dlwhich means mild and moderate anaemia. The gold standard for definite/severe being Hb level 5.0g/dl or less, which means severe anaemia.

The sensitivity and specificity with their confidence intervals (CI) of some pallor for mild and moderate anaemia (Hb more than 5 g/dl and <11g/dl) for different anatomical sites and for the definite/severe pallor for severe anaemia (Hb <5 g/dl) for the different anatomical sites and for the combination of different sites is summarized in the Table 9.

NB for table 9:

Some pallor means mild and moderate anaemia (Hb<11->5g/dl), Definite/severe means severe anaemia ( Hb<5g/dl)

PPV (Positive predictive value), NPV (Negative predictive value)

**Table 9: The performance indices of pallor at different anatomical sites for the detection of children with anaemia of different degrees (N=274)**

| Site of Pallor | Sensitivity(%) | CI | Specificity(%) | CI | PPV(%) | NPV(%) |
|---|---|---|---|---|---|---|
| **Conjunctiva** | | | | | | |
| Some | 77.7 | 71.4,82.9 | 88.1 | 76.5,94.7 | 96.0 | 52.0 |
| Definite/severe | 82.4 | 55.8,95.3 | 94.2 | 90.4,96.6 | 48.3 | 98.8 |
| **Nail bed** | | | | | | |
| Some | 80.0 | 73.9,85.0 | 88.1 | 73.9,85 | 96.1 | 54.7 |
| Definite/severe | 70.6 | 44.0,88.6 | 91.6 | 94.7,99.0 | 66.7 | 98.6 |
| **Palms** | | | | | | |
| Some | 75.3 | 68.9,80.8 | 74.6 | 61.3,84.6 | 91.5 | 45.4 |
| Definite/severe | 64.7 | 38.6,84.7 | 97.7 | 94.2,98.8 | 61.1 | 97.7 |
| **All three sites** | | | | | | |
| Some n=134 | 88.7 | 82.3,93.1 | 93.3 | 76.5,98.8 | 98.5 | 62.2 |
| Definite/severe n=11 | 100.0 | 67.9,100.0 | 84.89 | 67.3,94.3 | 56.9 | 98.2 |

The performance of pallor for the detection of children with laboratory confirmed malaria parasites that should receive an antimalarial drug according to the IMCI guidelines.

Of the 274 children studied 220 with prevalence of 80.3% of the children had parasitaemia of any level, 122 with prevalence of 44.5% had parasitaemia of 1-1999troph/ul and 98 with prevalence of 35.8% had parasitaemia of ≥2000troph/ul,

**Table 10: The relationship of definite /severe conjunctival pallor with the presence of parasitaemia.N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Conjunctival pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | ( %) | n | (% | n | (%) | N | (%) |
| Definite/severe | 4 | (13.8) | 9 | (31.0) | 16 | (55.2) | 29 | (10.6) |
| Not definite | 50 | (20.4) | 113 | (46.1) | 82 | (33.5) | 245 | (89.4) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

Chi square 25.74, p value 0.0000, this shows the significant different result that definite pallor can detect severe malaria

**Table 11: The relationship of some conjunctival pallor with the presence of parasitaemia. N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Conjunctival pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | ( %) | n | (%) | n | (%) | n | (%) |
| some | 31 | (17.8) | 86 | (49.4) | 57 | (32.8) | 174 | (63.5) |
| Not some | 23 | (23.0) | 36 | (36.0) | 41 | ( 41.0) | 100 | (36.5) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

Chi-square 9.67, P value 0.002 for parasitaemia level of 1-1999troph/ul, this showed significant difference however for parasitaemia level ≥2000troph/ul chi-square 3.79, P value was 0.05 did not show a significant different result.

**Table 12: The relationship of definite /severe nail bed pallor with the presence of parasitaemia. N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nail bed pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | (%) | n | ( %) | n | (%) | n | (%) |
| Definite/severe | 3 | (16.7) | 4 | (22.2) | 11 | ( 61.1) | 18 | ( 6.7) |
| Not definite | 51 | (19.9) | 118 | (46.1) | 87 | (34.0) | 256 | (93.4) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

Chi-square 34.3, P value 0.0000, for parasitaemia level of 1-1999troph/ul, and chi-square 40.1, p value of 0.000, for parasitaemia of >2000troph/ul, this showed significant difference that any pallor can detect malaria

**Table 13: The relationship of some nail bed pallor with the presence of parasitaemia. N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nail bed pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | ( %) | n | ( %) | n | (%) | N | (%) |
| Some | 30 | (16.8) | 88 | (49.2) | 61 | (34.1) | 179 | (65.3) |
| Not some | 24 | (25.3) | 34 | (35.8) | 37 | (38.9) | 95 | (34.7) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

Chi-square 10.22, P value 0.001for parasitaemia of 1-1999troph/ul, this showed significant difference however for parasitaemia level ≥2000troph/ul chi-square of 40.1, P value of 0.2141 it did not show a significant different result.

**Table 14: The relationship of definite /severe palmar pallor with the presence of parasitaemia.N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Palmar pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | (%) | n | ( %) | n | (%) | N | ( %) |
| Definite/severe | 3 | (16.7) | 4 | ( 22.2) | 11 | (61.1) | 18 | (6.7) |
| Not definite | 51 | (19.9) | 118 | (46.1) | 87 | (34.0) | 256 | (93.4) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

P value 0.0000,Chi square 34.3 for parasitaemia level of 1-1999troph/ul,and p value of 0.000,chi square 40.1for parasitaemia of>2000troph/ul, this showed significant difference that any pallor can detect malaria.

**Table 15: The relationship of some palmar pallor with the presence of parasitaemia.**

**N=274**

| | Parasitaemia level/ul | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Palmar pallor | O troph/ul | | 1-1999troph/ul | | ≥2000troph/ul | | Total | |
| | n | (%) | n | ( %) | n | ( %) | N | (%) |
| Some | 32 | (18.1) | 80 | (45.2) | 65 | (36.7) | 177 | (64.6) |
| Not some | 22 | (22.7) | 42 | (43.3) | 33 | (34.2) | 97 | (35.4) |
| Total | 54 | (19.7) | 122 | (44.5) | 98 | (35.8) | 274 | (100.0) |

Chi-square 0.18, P value 0.66, for parasitaemia level of 1-1999troph/ul and Chi-square of 0.39 p value of 0.5323 and for parasitaemia of ≥2000troph /ul they were not significant.

The Performance indices were then computed for some pallor and definite/severe pallor of each anatomical site, that are the conjunctiva, nail bed and palms against the different degrees of parasitaemia which are at 1-1999 counts/ul and at ≥2000counts/ul and for any level of parasitaemia which included parasites level from 1count/ul to more than ≥2000counts/ul

**Table 16: Performance indices of conjunctival pallor for the detection of children with malaria parasitaemia**

| Type of pallor | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|---|---|---|---|---|
| **Some** | | | | |
| AnyparasitaemiaN=274 | 65.0(58.3,71.2) | 42.6(29.5,56.7) | 82.2(75.5,87.4) | 23.0(15.4,32.7) |
| 1-1999counts/ulN=176 | 70.5(61.4,78.2) | 42.6(29.5,56.7) | 73.5(64.4,81.6) | 39.0(26.8,52.6) |
| ≥2000counts/ulN=152 | 58.2(47.8,67.9) | 42.6(29.5,56.7) | 64.8(53.8,74.5) | 35.9(24.6,49) |
| **Definite/severe** | | | | |
| AnyparasitaemiaN=274 | 11.4(7.6,16.5) | 92.6(81.3,97.6) | 86.2(67.4,95.5) | 20.4(15.7,26.1) |
| 1–1999counts/ulN=176 | 7.4(3.6,13.9) | 92.6(81.3,97.6) | 69.2(38.9,89.6) | 30.7(23.8,38.4) |
| ≥2000counts/ul N=152 | 16.3(9.9,25.5) | 92.6(81.3,97.6) | 80.0(55.7,93.4) | 37.9(29.7,46.8) |

The sensitivity and specificity of some conjunctiva pallor for detecting any parasitaemia or parasitaemia of 1 – 1999 counts/ul and ≥ 2000 counts/ul.was very high compared to sensitivity and specifity of definite/severe pallor

**Table 17: Performance indices of nail bed pallor for the detection of children with malaria parasitaemia**

| Type of pallor | Sensitivity(%CI | Specificity(%)CI | PPV(%)CI | NPV(%)CI |
|---|---|---|---|---|
| **Some** | | | | |
| AnyparasitaemiaN=274 | 67.7(61.1,73.8) | 44.4(31.2,58.5) | 83.2(76.8,88.2) | 25.3(17.2,35.4) |
| 1-1999counts/ulN=176 | 72.1(63.2,79.7) | 44.4(31.2,58.5) | 74.6(65.6,81.9) | 41.4(28.9,55.0) |
| ≥2000counts/ulN=152 | 62.2(51.8,71.7) | 44.4(31.2,58.5) | 67.0(56.3,76.3) | 39.3(27.3,52.7) |
| **Definite/severe** | | | | |
| AnyparasitaemiaN=274 | 6.8(4.0,11.2) | 94.4(83.7,98.6) | 83.3(57.7,95.6) | 19.9(15.3,25.5) |
| 1–1999counts/ulN=176 | 3.3(1.1,8.7) | 94.4(83.7,98.6) | 57.1(20.2,88.2) | 30.2(23.5,37.8) |
| ≥2000counts/ulN=152 | 11.2(6.0,19.6) | 94.4(83.7,98.6) | 78.6(48.8,94.3) | 37.0(29.0,45.6) |

The sensitivity of some nail bed pallor for detecting any parasitaemia or parasitaemia of 1 – 1999 counts/ul and ≥ 2000 counts/ul.was very high compared to sensitivity of definite/severe pallor, however definite/severe pallor had very high specificity.

**Table 18: Performance indices of palmar pallor for the detection of children with malaria parasitaemia**

| Type of pallor | Sensitivity(%)CI | Specificity(%)CI | PPV(%)CI | NPV(%)CI |
|---|---|---|---|---|
| **Some** | | | | |
| AnyparasitaemiaN=274 | 65.9(59.2,72.1) | 40.7(27.9,54.9) | 81.9(75.3,87.1) | 22.7(15.0,32.5) |
| 1-1999counts/ulN=176 | 65.6(56.4,73.8) | 40.7(27.9,54.9) | 71.4(62.0,79.4) | 34.4(23.2,47.4) |
| ≥2000counts/ulN=152 | 66.3(56.0,75.4) | 40.7(27.9,54.9) | 67.0(56.6,76.0) | 40.0(27.3,54.1) |
| **Definite/severe** | | | | |
| AnyparasitaemiaN=274 | 6.8(4.0,11.2) | 94.4(83.7,98.6) | 83.3(57.7,95.6) | 19.9(15.3,25.5) |
| 1–1999counts/ulN=176 | 3.3(1.1,8.7) | 94.4(83.7,98.6) | 57.1(20.2,88.2) | 30.2(23.5,37.8) |
| ≥2000counts/ulN=152 | 11.2(6.0,19.6) | 94.4(83.7,98.6) | 78.6(48.8,94.3) | 37.0(29.0,45.6) |

The sensitivity of some palmar pallor for detecting any parasitaemia or parasitaemia of 1 – 1999 counts/ul and ≥ 2000 counts/ul.was very high compared to sensitivity of definite/severe pallor, however definite/severe pallor had very high specificity.

**Table 19: Performance indices of pallor at all three anatomical sites for the detection of children with malaria parasitaemia**

| Type of pallor | Sensitivity(%) | Specificity(%) | PPV(%) | NPV(%) |
|---|---|---|---|---|
| **Some** | | | | |
| AnyparasitaemiaN=165 | 87.5CI(80.2,92.5) | 35.1CI(20.7,52.6) | 82.4 | 44.8 |
| 1-1999counts/ulN=114 | 79.2CI(68.2,87.2) | 35.1CI(20.7,52.6) | 71.8 | 44.8 |
| ≥2000counts/ulN=34 | 76.1CI(63.9,85.3) | 35.1CI(20.7,52.6) | 66.3 | 38.3 |
| **Definite/severe** | | | | |
| AnyparasitaemiaN=104 | 44.0CI(27.0,64.0) | 81.3,CI(53.7,95.0) | 81.3 | 44.8 |
| 1–1999counts/ulN=35 | 23.1CI(6.2,54.0) | 81.3,CI(53.7,95.0) | 63.0 | 35.4 |
| ≥2000counts/ulN=42 | 38.5CI(20.9,59.3) | 81.3,CI(53.7,95.0) | 79.2 | 37.3 |

The sensitivity of some pallor at all the three anatomical sites for detecting any parasitaemia or parasitaemia of 1 – 1999 counts/ul and ≥2000 counts/ul was very high compared to sensitivity of definite/severe pallor, however definite/severe pallor had very high specificity.

**Knowledge of health workers in IMCI**

A total of 26 health workers, which are all trained in IMCI, were interviewed to assess their knowledge in IMCI. These comprised of eighteen clinical officers, five clinical assistants, one nurse officer, one public health nurse'B' and one nurse assistant .A self administered questionnaire was used and answers related to knowledge of IMCI algorithm were asked to each participant. Results show that the level of knowledge of all the health workers on the IMCI guidelines ranked from good to excellent indicating that educational messages regarding the IMCI guidelines were well received. Twenty-five health workers who received in-service training for IMCI guidelines had acquired IMCI knowledge ranking from good to excellent; the other health worker who received pre service training ranked from good to excellent.

**Performance of health workers**

A total of 20 health workers among the 26 interviewed were observed for their performance in assessing children aged 2-59 months following the IMCI

guidelines for checking of general danger signs and systematically using it to detect and treat anaemia. Among them fourteen were clinical officers; five were clinical assistants, one nurse officer, one nurse assistant and one public health nurse. Nine health workers had opportunity to be observed while assessing children who had severe anaemia. The level of performance of all the nine health workers in assessing children with severe anaemia ranked from good to excellent.

Twenty health workers assessed children who had mild to moderate anaemia, of these thirteen were clinical officers, four were clinical assistants, one nurse officer, one nurse assistant and one public health nurse 'B'. All the nineteen health workers had their level of performance ranking from good to excellent; only one health worker had a poor level of performance.

Twenty health workers were observed for assessment of children for danger signs compatible with severe anaemia, of these thirteen were clinical officers, four were clinical assistants, one nurse officer, one nurse assistant and one public health nurse'B'.

Regarding the health workers in the detection of danger signs compatible with severe anaemia, fifteen health workers had a poor level of performance; only five had their level of performance ranking from good to excellent.

**Table 20: Health workers workload by number of patients seen per day**

| Number of patients | Frequency | ( % ) |
|---|---|---|
| 11-20 | 5 | ( 20) |
| 21-30 | 5 | ( 20) |
| 31-40 | 5 | ( 20) |
| 41-50 | 4 | ( 16) |
| 51-60 | 1 | ( 4 ) |
| Total | 20 | (100) |

60 % of clinicians attended less than 40 patients per day.

The mean workload per clinician per day was 29 patients per day.

The workload by clinicians was computed with the performance to see whether it influence performance. Table 21 explains the association.

**Table21: The association of number of clients seen by one health worker versus the level of skill performance. N=20**

| Numberofpatients/health worker | Skill performance: Good | | Poor performance | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) |
| <= 20 | 4 | (22.2) | 1 | (50.0) | 5 | (25.0) |
| >20 | 14 | (77.8) | 1 | (50.0) | 15 | (75.0) |
| Total | 18 | (90.0) | 2 | (10.0) | 20 | (100.0) |

Fisher exact test P value =1.0000

Therefore there is no association and the results shows that the workload does not influence performance.

**Table 22: Average time spent by each health worker with patients N=20**

| Average time spent (minutes) | Frequency (%) |
|---|---|
| 6-<8 | 11 (55.0) |
| 8-10 | 9 (45.0) |
| Total | 20 (100.0) |

55% of clinicians used less than 8 minutes per patient during the observation of assessment of children aged 2-59 months.

The mean time spent by health worker per consultation was 8minutes and 30 seconds

# CHAPTER FIVE

## 12: DISCUSSION

Childhood anaemia is a life threatening condition that requires prompt recognition and management using sensitive clinical signs that are easy to use by health workers in the periphery with no laboratory diagnostic facilities.

This study assessed the performance indices of pallor of the conjunctiva, nail bed and palms for the detection of children with low haemoglobin and malaria parasitaemia who should receive an antimalarial drug according to the IMCI guidelines. The study also assessed health workers adherence to the IMCI algorithm for the detection of children with anaemia.

This study shows that anaemia is a major health problem in the district similar to other studies from Africa and Bangladesh, which were done in rural districts similar to Mkuranga district (Zucker et all, 1996). Anaemia contributes not only to the high case fatality rate but also affects childhood development (WHO: 2000). In Tanzania where there is poor access to good health services and where malaria in children is Predominant, there is a need for validation of the standardized clinical approaches for identifying and treating anaemia. This data showed a high prevalence of severe, moderate and mild anaemia in the district, thus explaining the need to identify and

manage the children with anaemia appropriately. Anaemia was found to be less common in children aged more than 43 months that is only 7.3% of all who had anaemia.

The study suggests that severe anaemia is best detected by using conjunctiva pallor (sensitivity 82.4%CI 55.8,95.3), followed by nail bed pallor (sensitivity 71%CI 44.0,88.6), palmar pallor was the least useful (sensitivity 65%CI 38.6,84.7). In a study in Bangladesh palm pallor was shown to have a lower sensitivity than conjunctival pallor for both severe and moderate anaemia probably because of the increased palm pigment (Kalter et al, 1997). While for the whites it was highly sensitive for nail bed and the palm (Nardone et al, 1996). For moderate and mild anaemia the trend showed that some nail bed pallor was the best (sensitivity 80% CI73.9, 85.0) followed by some conjunctival pallor (sensitivity 78% CI71.4, 82.9) and palm pallor was the least (sensitivity 75% CI68.9, 80.8). The sensitivities and specificities of the 3 anatomical sites shows no significant difference as the confidence intervals do overlap, therefore any site if used to screen for anaemia will give the similar precision. However for the matter of simplification of the use of palm pallor as a screening test will help the front line health workers to pick up children who need referral or treatment for anaemia and malaria easily.

Clinically severe pallor gave a high sensitivity, therefore can be used to screen for children who will be having severe anaemia so as to be referred early for blood transfusion, while for those with mild and moderate anaemia due to high morbidity that they cause will receive iron therapy.

The data suggests that both severe and uncomplicated malaria can best be detected by presence of some pallor at any anatomical site (sensitivity 69% and 62% respectively). However severe pallor is not very sensitive (sensitivity 44%) but was very specific (specificity 81%).Some palm pallor was the best at detecting severe malaria that it could pick 66% of all children who will be having malaria and followed by nail bed pallor 68% and conjunctival pallor 65% sensitive. When clinical pallor is used in combination the sensitivity to detect severe and uncomplicated malaria becomes 44% and 88% respectively, which are very useful levels for early detection of morbidity so as to institute management early.

The study found that most of the clinicians had more than average knowledge on IMCI (100%) and skill for detecting and treating severe and moderate anaemia (95%), however the performance was lacking by 75% for detecting general danger signs. This discrepancy is similar from what has been observed by other studies where the discrepancy between knowledge and practice among health workers had been observed in Magu by Bwire (2001) showed that 96% of the health workers had adequate knowledge on IMCI but general danger signs were assessed only in 8% of the children who had fever. Respiratory rate was taken only in 43% of the children who presented with cough.

In another study in Western province of Kenya by Odhacha et al (1998) during the evaluation it was observed that HWs performed well overall after the end of training for

classifying and treating moderate disease (85 % and 84 % respectively) but they performed poorly in classifying and treating severe disease (31% and 32% respectively). The performance continued to improve with clinical supervisions conducted during the study. This could be due to the fact that the health workers knew that they are been observed or because they have recently been trained. Clinical supervision needs to be strengthened so as to improve the performance.

In this study it was observed that majority of the clinicians (60%) saw children between 6 and <8 Minutes .The mean time clinicians spent with children was 8 minutes and 30 seconds and with a mean workload of about 29 patients per day. A period of 8.30 minutes was not adequate for following the IMCI algorithm chart; a minimum of 20 minutes is required per each consultation. This was also observed in the study by Bwire (2001) where a mean time clinicians spent was 5 minutes despite that their clinics were not busy with mean workload of 20 patients per day. Also a study by Akim (1994) showed that 55% of the patients were seen for less than 5 minutes. However in this study it was shown that workload have no association in influencing performance. However the short time per consultation won't be entertained as it reduces the quality of service.

# CHAPTER SIX

## 13: CONCLUSSION AND RECOMMENDATIONS

### 13:1 CONCLUSION

The study has found that IMCI algorithms addressed all the degrees of anaemia and supports the diagnosis of anaemia by 75%(CI 68.0, 80.8), the sensitivities of the conjunctiva and nail bed are higher than that of the palms however the confidence intervals do overlap, therefore, there is no necessity of adding other signs in the algorithm for simplicity of the use of the palms and because of the busy clinics that we have. Clinical pallor can pick up children with malaria, therefore in facilities where laboratory service is not available they can rely on clinical signs to manage both anaemia and malaria.

There is improvement in knowledge and practice among the health workers compared to other studies, except more emphasis should be on the assessing children for general danger signs.

### 13:2 RECOMMENDATIONS

1 The ministry of health through its council hospitals should strengthen supportive supervision especially for assessment of general danger signs to every child who is under five years, so as to provide better health care service.

2 Clinicians have to spend more time during consultations at least 20 minutes so as to take better history and examine in order to manage IMCI conditions better.

## 14. REFFERENCES

Akim C S.(1994).Management of malaria in underfives by Primary Health Care workers in Bagamoyo district. *Dissertation submitted for partial fulfillment for MSc(TDC) the degree of Master of Science in Tropical Disease control.*

Bwire YM (2001). Evaluation of IMCI in the diagnosis of febrile illness in Magu District, Mwanza, and Tanzania.*Dissertation submitted for partial fulfillment of the requirements for the degree of Master of Public Health in the University of Dar Es salaam.*

Desai MR,Philips-Howard PA,Terlouw DJ,Wannemuehler KA,Odhacha A,Kariuki SK,Nahlen BL .Recognition of pallor associated with severe anaemia by primary care givers in Western Kenya. Trop Med Int Health.2002 Oct; 7(10): 831-9.

Font F,Alonso GM,Nathan R,KimaroJ, Lwila F ,Ascaso C,Tanner M,Mendezes C,Alonso PL.Diagnostic accuracy and case and management of clinical malaria in the primary health services of a rural area in south –eastern Tanzania.Trop Med Int Health.2001 Jan,6(6):423-8)

Gove,S.(1997).Integrated management of childhood illness by outpatient workers: Technical basis and overview .Bulletin of World Health Organization ,75(Supplement 1):7-2

Gove,S.(1997) Integrated management of childhood illness :conclusions .Bulletin of the World health Organization,75(supplement):119-128.

James H.Hutchison and Forrester Cockburn.Practical Paediatric Problems, Sixth Edition: 486 – 490.

Kalter HD, Burnham G, Kolstad PR et al. (1997) Evaluation of clinical signs to diagnose anaemia in Uganda and Bangladesh, in areas with and without malaria. Bulletin of the World Health Organization75,103-111.

Kalter HD, Schillinger JA, Hossain M et al. (1997) Identifying sick children requiring referral to hospital in Bangladesh. Bulletin of the World Health Organization 75, 65-75.

Luby SP, Kazembe PN, Redd SC et al. (1995) Using clinical signs to diagnose anaemia in African children. Bulletin of the World Health Organization 73, 477-482.

Lulu M, Birhane O, Hirut D , Shabbar J and Weber MW Evaluation of clinical pallor in the identification and treatment of children with moderate and severe anaemia .Trop Med & Int Health .Volume 5 Issue 11 Page 805 - Nov 2000.

Ministry of health, (1999). Health statistics abstract.Vol.1Morbidity and Mortality statistics.26-28, 51

Mkuranga District Comprehensive council health plan document 2003.

Nardone D.A.,Roth K.M.,Mazur D.J.,McAfee J.H.Usefulness of physical examination in the presence or absence of anaemia .Arch. Intern .Med. 1990;150:201-204

Odhacha A,Orone H,Pambala M,Odongo R. Health workers performance after training in Integrated Management of Childhood Illness-Western Province,Kenya,1998.CDC and Prevention.MMWR. Nov1998; 47(46); 998-1001

Tarimo D.S, Moshiro D,Mpembeni R,Minjas J.N. Field trial of the direct accridine orange method and ParaSight-F test for the rapid diagnosis of malaria.Trans. Royal. Soc. Trop. Med. & Hyg. (1999) 93, 1-2

WHOReport: Malnutritionwordwide.www.mikeschoice.com/reports/malnutrition- Worldwide.htm _65

Ministry of health, (1999). Health statistics abstract.Vol.1Morbidity and Mortality statistics.26-28, 51

Mkuranga District Comprehensive council health plan document 2003.

Nardone D.A.,Roth K.M.,Mazur D.J.,McAfee J.H.Usefulness of physical examination in the presence or absence of anaemia .Arch. Intern .Med. 1990;150:201-204

Odhacha A,Orone H,Pambala M,Odongo R. Health workers performance after training in Integrated Management of Childhood Illness-Western Province,Kenya,1998.CDC and Prevention.MMWR. Nov1998; 47(46); 998-1001

Tarimo D.S, Moshiro D,Mpembeni R,Minjas J.N. Field trial of the direct accridine orange method and ParaSight-F test for the rapid diagnosis of malaria.Trans. Royal. Soc. Trop. Med. & Hyg. (1999) 93, 1-2

WHOReport: Malnutritionwordwide.www.mikeschoice.com/reports/malnutrition- Worldwide.htm _65

www.tanzania.go.tz/2002 population and housing census – General report.htm. Coast region.Mkuranga District Total population by age in single year ages, Five year age group and sex.

Weber MW, Kellingray SD, Palmer A, Jaffar S, Mulholland EK & Greenwood BM (1997) Pallor as a clinical sign of severe anaemia in children: an investigation in the Gambia. Bulletin of the World Health Organization 75,113-118.

WHO (1995) Integrated management of the sick child. Bulletin of the World Health Organization 73, 735-740.

Zucker JR, Perkins BA, Jafari H, Otieno J, Obonyo C & Campbell CC (1997) Clinical signs for the recognition of children with moderate or severe anaemia in western Kenya. Bulletin of the World Health Organization 75, 97-1