FACTORS INFLUENCING QUALITY CLINICAL CASE MANAGEMENT OF SEVERE MALARIA AMONG CHILDREN AGED 6 MONTHS TO 59 MONTHS BY HEALTHCARE PROVIDERS IN KISUMU COUNTY

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A Thesis Submitted in Partial Fulfillment of the Requirements for theDegree of Master of Science in Advanced Nursing Practice (Pediatric Nursing)of Masinde Muliro University of Science and Technology

August , 2025

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DEDICATION

I dedicate my research work to my lovely husband , my children, my lovely Mother and the entire Maoga's family who have stood by me and have been a great source of encouragement to me. One Love.

ACKNOWLEDGEMENTS

I would want to thank the almighty God for granting me good health, time and financial resources required to complete this degree. My employer Kisumu County, Ministry of health for giving me humble time to study. Dr. Alex Chebor and Dr Bonface Nyumbile under the great leadership of Prof. Kipmerewo who supported and guided me through my academic journey, with a lot of humility deserve a special thanks for their dedication and hard work. I sincerely thank them in a special way for their unwavering guidance and support throughout the process of developing my document up to this very stage.

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May God's favor follow you for the rest of your lives Amen!”

ABSTRACT

Severe malaria in under 5 continues to be public health concern in malaria endemic areas. In Kisumu County, most cases of severe malaria are observed at Kisumu West and Nyakach sub-counties in Kisumu West. However, quality of management of this condition is not well understood. The aim of the present study was to determine the effect of caregiver, Healthcare providers, and health system associated factors that influence quality of management of severe malaria in under-five in Kisumu County. This was a mixed methods prospective cross-sectional study which took place between April and July 2023. Three hundred and forty-four under-fives, 78 healthcare providers and 8 key informants were recruited into the study. Qualitative data was collected using a key informant interview guide and analyzed using thematic analysis. Quantitative data was obtained through questionnaires and observational checklists and summarized using descriptive statistics and analyzed using SPSS version 27. Most children were ≥12 months (286/344, 83.1%), with a mean age of 12.58±1.67 (1.30-59.00). Most caregivers were between 25 and 34 years (174/344, 50.6%), had a mean age of 32.33±7.13 (18.00-56.00), had attained tertiary level of education (220/344, 63.9%). Most healthcare providers were nurses (52/78, 67%), diploma level of education (65/78, 83%), majority had received Integrated management of neonatal and Childhood illnesses training (46/78, 59%), and had attended a Continued medical education or in-service training on case management (75/78, 96%). Microscopic tests were mainly done in the study area (182/344, 52.9%), oral Artemisinin combined therapy was mainly administered (124/344, 36.0%) as compared to artemether injection(124/344, 36.0%). Under-five Males were 40% less likely to receive optimal malaria treatment (OR: 0.6; 95% CI: 0.4 – 0.9; p = 0.017). Cases managed by in integrated management of neonatal and child illnesses trained healthcare providers were 60% more likely to receive quality malaria treatment compared to non-trained (OR: 0.4; 95% CI: 0.3 – 0.7; p = 0.0005). Children of younger caregivers ≤25 years were 3.5 times more likely to have received optimal management relative those whose caregivers were ≥25 years of age (OR: 3.5; 95% CI: 1.7 – 7.3; p = 0.0005). Similarly, children whose caregivers had attained primary education had higher odds of receiving optimal malaria management unlike those whose parents had higher level of education (OR: 5.8; 95% CI: 2.6 – 12.7; p < 0.0001). The study has demonstrated that factors related to the caregivers, HCPs, and health system significantly influence the quality of management of malaria in under-five in the study area. Key findings indicate that male children are less likely to receive optimal care compared to females.. Moreover, HCPs with IMNCI training significantly enhanced the quality of malaria treatment. Interestingly, caregivers' age and education level were among the critical determinants, where children of younger caregivers (≤25 years) and those who had primary education being more likely to receive optimal management. These results suggest that caregivers demographic factors and HCPs' skill levels play a substantial role in the quality of malaria management in the region. These findings suggest that there should be continuous in-service training programs, particularly on IMCI, to ensure that HCPs across County Hospitals are equipped with the skills required for optimal malaria management. Therefore, equitable access to quality malaria case management for under-fives is important in that awareness programs targeting gender biases and reinforcing treatment guidelines that emphasize gender neutrality in clinical decisions is in place. Caregivers to be enlightened on the importance of timely and appropriate treatment seeking behavior, regardless of their education level. Most importantly, there is need for **s**trengthening health facilities capacity to provide accurate and timely diagnostic services and also ensuring uniformity in treatment protocol utilization. Finally, there is a need to establish robust monitoring systems to track the implementation of training, caregiver support programs, and adherence to standardized treatment protocols. This will help identify gaps and enable timely adjustments to improve malaria management outcomes.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACT	Artemisinin-based Combination Therapy
AVPU	Alert, Verbal, Painful, Unresponsive
CDC	Centers of Disease Control
ETAT	Emergency Triage Assessment and Treatment Plus
GCS	Glasgow Coma Scale
HIV	Human Immunodeficiency Virus
HCP	Healthcare Providers
IMNCI	Integrated Management of Neonatal and Childhood Illness
KMIS	Kenya Malaria Indicator Survey
KNBS	Kenya National Bureau and Statistics
LMIC	Low and middle-income countries
MDG	Millennium Development Goals
MoH	Ministry of Health
Mrdt	Malaria Rapid Diagnostic Tests
NMCP	National Malaria Control Program
PCR	Polymerase Chain Reaction
RTS,S	Repeat T-cell Surface Antigen
SDG	Sustainable Development Goals
WHO	World Health Organization

OPERATIONALIZATION OF KEY TERMS

Adherence: Measured by proportion of healthcare workers/healthcare facility providing malaria treatment that is consistent with World Health Organization Guidelines on treatment of severe malaria.

Children: Young participants between age of 6 months to 59 months

Clinical Case management: Process of providing care to under five children with severe malaria as per prescribed World Health Organization/Ministry of Health Guidelines on treatment of severe malaria. This will defined by proportion of children receiving adequate test for malaria and those receiving correct first line treatment for severe Malaria (WHO, 2012).

Healthcare poviders. This are technical staff offering services to the sick children in the facility. They comprise of Nurses, Clinical Officers and Medical Officers

Healthcare seeking behavior: Defined in this study as seeking care within 24 hours from onset of symptoms related to severe malaria.

Quality management: The degree to which care offered to patients increase the likelihood of p o s i t i v e health outcomes and are in line with malaria treatment guidelines. This will be defined by proportion of severe malaria patients receiving care that is consistent with treatment guidelines on management of severe malaria.

Severe malaria: Classification of Malaria in children below five years characterized by presence of parasitaemia (100 000/µl ~2.5% parasitaemia) on Malaria blood film test or positive Rapid Malaria diagnostic test (RDT).

CHAPTER ONE

INTRODUCTION

1.1 Overview

This section presents the background to the study, statement of the problem, purpose, objectives, and research questions. This section also includes details on justification, scope, limitations, and operational definition of terms.

1.2 Background to the Study

Prompt diagnosis and early treatment are key to management of malaria and other infections effectively in endemic areas. Malaria is an old parasitic disease described in ancient civilization as an acute illness of varying severity caused by protozoa.(Nosten, Richard-Lenoble, & Danis, 2022). It is the leading cause of morbidity and mortality globally particularly among children below five years. Africa generally bear the heaviest burden of all malaria cases in the world. According to (Kruger, Heinzel-Gutenbrunner, & Ali, 2017). It contributed over 90% of P. falciparum malaria cases which causes the world's severe forms of malaria especially in children in 2017 and over 92% of child mortality. The burden of malaria among this age category varies across several countries in Sub-Sahara Africa. It accounts for 10% of all deaths of children according to (Okoyo *et al.,* 2021).

In Nigeria, Malaria contributes to more than 30% while Tanzania more than 10% of the total admissions (Milner *et al.,* 2020), 61% of all mortalities in Mali according to (Fomba *et al.,* 2020), while 10.9% deaths of all hospital deaths in Uganda, according to (Zalwango *et al.,* 2022) . Western Kenya region being a malaria epidemic prone setting, 63.4% of the total admissions were children below 5 years of age (Kapesa *et al.,* 2018).

Quality of care in Europe was rated to be high where 98.4% of patients with severe malaria survive (Kurth et al., 2017) while in Asia, there was a notable improvement in patients admitted and managed for severe malaria in public health facilities as compared to those in private sector (Group, Phok, Phanalasy, Thein, & Likhitsup, 2017). According to (Group et al., 2017), 90% of patients in Cambodia were treated after receiving a confirmatory test for malaria while in Laos and Myanmar, more than half of patients were treated without being subjected to malaria test despite availability of rapid diagnostic test kits in public hospitals. In a study conducted in Northern Sudan by (Khalid Mohamed, Khalid Mohamed, Ahmed, Saad, & Zurovac, 2024) there is a great impact of behavioural and systemic challenges in malaria management among HCPs in reference to protocols which has been attributed to inadequate resource, training gaps, inconsistency in supportive supervision, patient flow, minimal testing rates on admission, continued practice in presumptive anti-malarial treatment without confirmation, lack of parasitological monitoring, use of outdated medicines and non-adherence to treatments to completion just to mention a few.

Western Kenya region, is a malaria endemic zone with the highest prevalence of *P. falciparum* in the country (NMCP, KNBS, and ICF International; 2016). Among the total deaths occurred from malaria in 2018, more than two-thirds were among children below 5 years. That notwithstanding, this age group generally has a higher risk of acquiring malaria and thereby subjecting them to higher chances of developing adverse effects compared to children above five years according to (Milner *et al.,* 2020). Therefore, failure to adhere to recommended procedures in malaria management has contributed to increased burden of malaria across a number of countries in Africa (Leslie, Gage, Nsona, Hirschhorn, & Kruk, 2016) (Cohen, Leslie, Saran, & Fink, 2020). WHO developed malaria case management guideline as a

strategy inthe fight against severe malaria (WHO, 2020) where for, case management depends on timely and correct diagnosis of severe malaria which is determined through obtaining full history, complete physical examination, and timely laboratory blood analysis to identify presence of *Plasmodium* (MOH, 2018).

Treatment should be initiated when there is suspicion of severe malaria based on clinical examination even when laboratory results are pending (WHO, 2023). Management includes; parenteral administration of anti-malarial medicines and supportive treatment (fluid replacement, correcting hypoglycemia, controlling convulsions, monitoring of vital signs, and assessing need for blood transfusion) (WHO, 2018). Upon diagnosis, the patient should be initiated on first line treatment of Artesunate injection at 2.4mg/kg per body weight 0 dose immediately on admission, 12 hour and 24 hour doses from 0 dose respectively. Alternative treatment includes either Artemether or quinine injection when Artesunate is not readily available. Patient shall continue with oral anti- malarial therapy once they can tolerate oral medication (WHO, 2018). Therefore, quality of care is critical in determining the clinical outcome of patients presenting with severe malaria.

In reference to the burden of malaria on African children, appropriate, timely and comprehensive case management should therefore be considered a priority (Yahaya, Adeyemo, Aboagye-Mensah, Ahor-Essel, & Kumah, 2024). According to some study findings, quality of management provided by HCPs does not meet the recommended standard. (Cohen, Leslie, Saran, & Fink, 2020)observed low compliance to national malaria guidelines, where close to 66% of children were neither tested nor received recommended therapy for malaria. For a fact, Performing accurate malaria diagnostic test and providing patients with correct malaria therapy are the key aspects in malaria

case management hence, failure to achieve these two, results in poor quality care to patients. In Sudan, the compliance was found to be as low as (2%) with less than 15% of patients receiving essential tests and only half receiving correct malaria treatment asper guideline (Elnour, Alagib, Bansal, Farag, & Malik, 2019). These factors compromise the treatment-outcome and patient survival despite nearly 98% of patients having been correctly diagnosed to be having severe form of malaria. Lack of compliance to treatment guidelines means that patients end up receiving sub-optimal care thus risking poor outcomes (Cohen *et al.,* 2020; Elnour *et al.,* 2019).

In Kenya, training programs like "Emergency Triage Assessment and Treatment Plus Admission Care" (ETAT+) have contributed greatly towards healthcare providers' utilization and adherence to clinical protocols and quality of care provided to children seeking healthcare services in health facilities within the country. In support of minimizing severe malaria-related deaths, training and supporting health care providers on use of management guidelines will come in handy (Opoka *et al.,* 2019). Therefore, inadequate knowledge on malaria treatment among the health facility workforce will continue to affect management of severe malaria (Shah *et al.,* 2016). That not withstanding, the cost of treatment also exposes patients to defaulting treatments thus endangering their lives as well as promoting resistance. Despite the adoption of "test, treat and track" policy on malaria management overtime, there isstill poor adherence to malaria management protocol among HCPs managing under-fives (Opoka *et al.,* 2019). This was attributed to the uncertainty of differences in management guidelines from both Malaria Program and Integrated Management of Neonatal and Childhood Illnesses (IMNCI) that could bring confusion on management among HCPs (Bilal *et al.,* 2015).

Kisumu County has the highest prevalence of malaria, three times of the national (6%) It accounts for over 30% of hospital admissions among children under five years(Odhiambo et al., 2023). This has been associated with the shedding of maternal immunity and also having not developed specific immunity to infection thus at risk of complications related to malaria according to (Milner et al., 2020).Study findings from different countries suggest a variety of disparities between standards and processes in relation to diagnosis and treatment of malaria which also vary across different regions. To understand the management of malaria, it is imperative to understand the subject characteristics, diagnostic approach, prescribing patterns and their alignment with WHO and local guidelines(Baraka et al., 2023).

The IMCI strategy includes both curative and preventive interventions targeted at improving health practices at health care facilities, at home, and in the community, improvement in the case management skills of health care staff through provision of locally adapted guidelines on IMCI and activities to promote their use, improvement in the overall health care system required for effective management of childhood illnesses; and improvement in family and community health care practices. Low quality malaria care has been linked to patient healthcare seeking behavior, delay in seeking care, lack of diagnostic capacities in rural health facilities, inadequate supplies and failure by HCPs to follow guidelines (Cohen *et al.,* 2020). Treatment expenses associated with cost-sharing practices has also pushed patients to seek self –treatment thereby limiting their access to accurate diagnosis and management of severe malaria (Hennessee *et al.,* 2017). Therefore, to reduce malaria related morbidity and mortality in children below 5 years, HCPs need to triage critically ill patients, make accurate diagnosis using findings from history, physical examination, and diagnostic testing. Failure to use guidelines correctly might significantly impact on quality of care provided

to patients. This study sought to assess the Influence of quality clinical case management of severe malaria in children 6 to 59 months by HCPs in Kombewa and Chulaimbo County Hospitals in Kisumu County.

1.3 Statement of the Problem

Extensive assessment for patients with suspected malaria is recommended on admission and during hospital stay to optimise care and prevent further complications thereby minimizing mortality associated with severe malaria. (Machini, Achia, Kipruto, Amboko, & Chesang, 2022) . Malaria still remains a burden predominantly among under five children 3 to 59 months across a wide range of regions in East Africa (Akech *et al.,* 2020) (Paton *et al.,* 2021). Plasmodium f*alciparum* has been reported to be the most virulent species in Africa accounting for 92% of all severe forms of malaria(Odhiambo *et al.,* 2023). Western Kenya has the highest prevalence of *P. falciparum* in the country according to (Milner *et al.,* 2020). Far-reaching impact of malaria at individual, household and national level demands that appropriate interventions be provided in order to reduce the burden of malaria at all levels. Part of these interventions include but not limited to promoting use of national guidelines that prescribe standards and procedures for quality management of severe malaria. Active case management in terms of accurate detection of Plasmodium infection, prompt treatment with an effective antimalarial and adequate supportive care has been found to be essential in improving health outcomes in patients with severe malaria (WHO,2018)**.** Therefore, Lack of quality management of severe malaria mainly associated with failure to comply with management guidelines continues to make it hard to achieve the goal of reducing malaria burden.

According to WHO, (2018), it has been reported that inadequate quality care

contributes to nearly two-thirds of preventable malaria deaths**.** In Western Kenya, Malaria is a major cause of admission where 63.4% of the total admissions were children below 5 years of age according to (Kapesa *et al.,* 2018) and point to note, most of the hospitalizations are commonly concentrated among children aged between 6 months to 4 years of age (Kamau *et al.,* 2022). Kisumu County has the highest prevalence of malaria in Kenya (18%) . It accounts forover 30% of hospital admissions among children under five years (Odhiambo *et al.,* 2023). According to (Division of National Malaria Programmme, 2021, (Akech *et al.,* 2020) children below 5 years in this region present with severe form of malaria thereby posing a great challenge to HCPs in terms of timeliness and accurate care provision . However, there has been considerable efforts to promote active case management of severe malaria through a 3-day training module which is done periodically by the Division of National Malaria Programme according to (Odhiambo *et al.,* 2023).

From statistics, quite a number have updates on malaria management according to (health sector annual performance report FY 2020/2021), 60 trainer of trainees and 2932 HCPs were trained in lake endemic counties on malaria case management. Despite this, there are gaps still in quality of management of severe malaria across health facilities in Kisumu County. Adherence to the malaria management guidelines is becoming a problem as people suffering from malaria-related symptoms either self-medicate with over-the-counter medications or do nothing and only seek treatment from health facilities when their symptoms become severe (Otambo et al., 2022). Therefore, it is prudent to ascertain factors influencing the quality clinical case management of severe malaria among children 6 to 59 months by HCPs in Kisumu County and identify areas of intervention.

1.4 Research Objectives

1.4.1 Main Objective

To determine factors influencing the quality management of severe malaria in children 6 to 59 months by healthcare providers in Kisumu County.

1.4.2 Specific Objectives

Specifically, the study aims to:

i. Examine the association between child characteristics and quality clinical case management of children with severe malaria

ii. Assess the influence of caregiver and Healthcare provider characteristics and quality clinical case management of children with severe malaria

iii. Evaluate the influence of health system factors on quality clinical case management of children with severe malaria

1.5 Hypothesis

Ho_1: There is a no relationship between child characteristics and quality clinical case management of children with severe malaria

Ho_2: Caregiver, healthcare provider characteristics and quality clinical case management of children with severe malaria

Ho_3There is a no relationship between health system factors and quality clinical case management of children with severe malaria

1.6 Justification of the Study

Approximately 70% and 80% of all malaria cases globally and Kenya respectively were attributed to children under the age of five by 2015, making it a significant public health concern (KMIS 2020). According to Treleaven (2019), children worldwide are less likely to have favorable treatment results if they rely on unskilled and unqualified practitioners and can also face delays in accessing high-quality care. According to

WHO, the number of deaths due to malaria in children >5 years has significantly declined since 2000 however, in Sub-Saharan Africa, it is still a burden accounting for 10% of all deaths in children according to (Okoyo *et al.,* 2021) Kenya alone is contributing about 3% of malaria deaths globally (WHO, 2021). Sarfo *et al.,* 2023 reported that despite the dedicated efforts to fight malaria globally, in every 2 minutes, a child below 5 years dies of malaria in Sub Sahara Africa. This agrees with study done by (Mutsigiri-Murewanhema *et al.,* 2017) in Zimbabwe where anyone living or visiting a malaria endemic area are at risk with a higher vulnerability in certain special groups to include children.

In Africa, quality management of severely ill patients remains unmet. As the disease progression become increasingly complex, better supportive and basic attention for severe malaria are still required. Despite a reduction in malaria transmission, hospitalization and mortality from malaria in Western Kenya continues to be centered in children below 36 months (60%) according to (Akech *et al.,* 2020). This is a clear indication that more measures must be put in place to protect this vulnerable age set. Most deaths from malaria are avoidable with timely diagnosis and quality management (Sultana *et al.,* 2017). In the absence of enhanced management, malaria will persist as a prominent contributor to under-five mortality. Consequently, many LMICs, including Kenya, would be unable to achieve the global objective of reducing malaria mortality rates by a minimum of 90% by 2030 (Macarayan, Papanicolas, & Jha, 2020). Secondly, relatively little is known regarding quality of care by HCPs with reference to the national malaria guidelines in Kisumu County (Odhiambo *et al.,* 2023).

This study sought to establish the impact on quality of care, thus provide information on status of malaria care and also identify areas that need to be strengthened in the fight against severe malaria. Secondly, to further inform policy makers at county government on areas that need improvements in the malaria case management and most importantly strengthen utilization of malaria treatment guideline.

1.7 Limitations of the Study

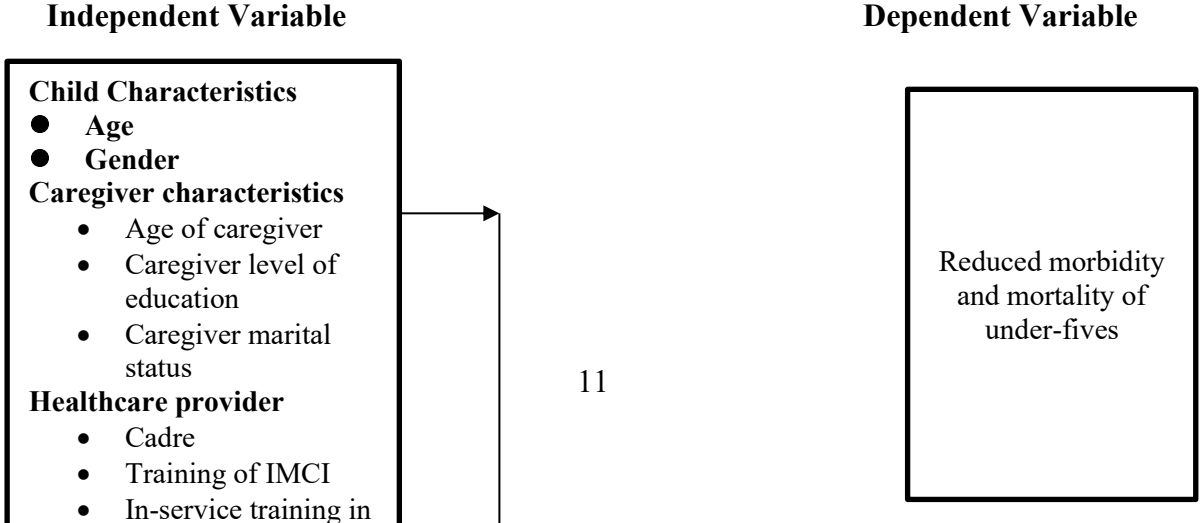
Since the primary records were not digitized, they were replete with missing information and errors stemming from faulty filing practices. Most of the required information on daily reviews were missing. The sample size was reduced from the expected 349 to 344 as a result, which is still acceptable. Inpatient records were expected to over-represent severe malaria conditions requiring hospitalization and under-represent similar cases that ended up in lower level hospitals. They also under-represented children with severe malaria whose caregivers did not seek care when the child is sick (participation bias). For instance, caregivers from poor families may not seek care if they cannot afford the costs of transportation. The demographic domain was limited to age and sex for the child and age, level of education and marital status for the caregiver, precluding other social identities (tribe, religion, employment status, birth order of the child) and more sophisticated intersectional analysis. However, the data can inform hypotheses about the relationships between the identified independent variables and quality clinical case management of severe malaria in children.

1.8 Conceptual framework of the Study

The management of severe malaria constituted the dependent variable of the research. This was assessed through the implementation of prescribed anti-malaria treatment and the utilization of appropriate laboratory tests. Failure to adhere to these protocols was cited as the reason for non-compliance.

The quality of care, as conceptualized by care provider characteristics, child and caregiver characteristics, and health system factors, is the independent variable of the study. The characteristics of the caregiver were assessed based on factors such as the caregiver's marital status, level of education, gender, and the age of the child. Qualities of care providers were assessed through the utilization of cadre, IMCI training, in-service training in severe malaria case management, years of service, and in-service training. The third variable, health system factors, were assessed through the facility stockings, type of health facility, and availability of essential packages. The concept of the mediating variable was defined as the accessibility of treatment guidelines for severe malaria. The researcher hypothesizes that a suitable balance between the characteristics of caregivers, healthcare providers, and health systems will result in adequate management of severe malaria in children under the age of five in Kisumu County. Nevertheless, this could be mitigated by the presence and execution of effective malaria management policies. These policies will consistently provide guidance on the manner, scope, and participants in particular actions.

Details of the conceptual framework are shown in the figure 1.1 below.



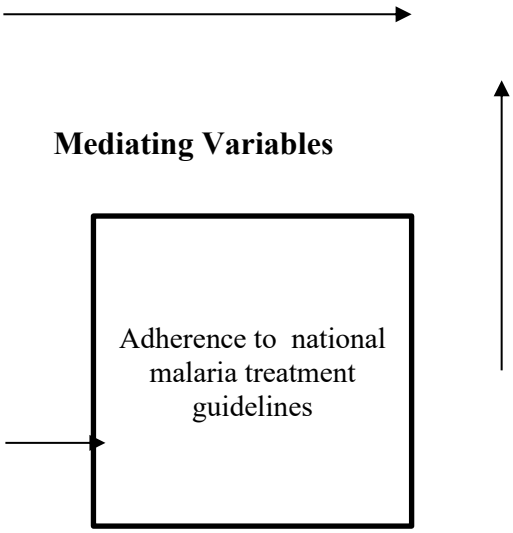


Figure 1. 1: Conceptual framework

(Adopted from Donabedian model 1980)

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter presents findings from critical review of published works of literature. The literature review is organized according to the study objectives which are to; examine the association between child characteristics and quality clinical case management of severe malaria, determine the influence of caregiver/ HCP characteristics and quality of clinical case management of children with severe malaria, and evaluate the influence of health system factors on quality of clinical case management of children with severe malaria. Key terms used in identifying relevant literature for this study.

2.1.1 Epidemiology of malaria

The clinical significance of malaria cannot be underestimated. According to (Okoyo *et al.,* 2021) malaria in children below the age of five is considered to be of public health concern. It is a protozoa infection caused by *Plasmodium*. There are eight species causing human malaria, but five of them are clinically relevant species within the genus plasmodium of interest in transmission of malaria: *P. falciparum, P. vivax, P. ovale, P. malariae, and P. knowlesi* (WHO, 2021). Malaria is transmitted mainly through bite of an infected female anopheles' mosquito to human host. Other forms of transmission include accidental transmission via blood transfusion and congenital transmissionfrom mother to child during pregnancy (WHO,2021).

In Kenya, malaria transmission has been categorized into five ecological zones, namely Lake endemic zone comprising of 5 counties bordering Lake Victoria, Highlands Epidemic which experiences seasons of malaria outbreaks especially in highland areas in Rift Valley. Coast endemic which comprises of low-lying areas along Indian ocean, seasonal transmission areas of Rift Valley, North-Eastern part of the country and low risk areas comprising of highlands of central Kenya and Nairobi

(Macharia *et al.,* 2019).

Malaria is a significant contributor to the death rates of children under 5 and pregnant women in non-industrialized nations. At this stage, their immune system is still inexperienced against plasmodium, thereby heightening their susceptibility. It has been established that young children are more likely to experience sequelae resulting from complications related to severe malaria, including severe anemia, respiratory distress, and cerebral malaria, among others. *P. falciparum* infectious malaria continues to be the leading cause of hospitalisation in sub-Saharan Africa(Debash et al., 2022). Even with the expansion of vector control measures such as durable insecticide-treated nets, indoor residual spraying, and efficient, timely treatment, the decline in the malaria burden has remained high.

In light of the imminent danger posed by emerging drug resistance and intensified insecticide resistance, the malaria vaccine has been included as an auxiliary measure in the routine immunization program in specific regions of Ghana, Kenya, and Malawi It is administered to children at the age of 6, 7, 9, and 24 months for doses 1–4 respectively, with the goal of saving tens of thousands of young lives annually and improve African health by reducing morbidity and mortality (Ashley & Poespoprodjo, 2020). According to (Osoro *et al.,* 2024), WHO advised the use of the RTS,S vaccine in areas with moderate-to-high transmission of *P. falciparum* infections. The decision to take this measure was based on the observed partial resistance to artemesinin derivatives. This resistance was found to be linked to delayed clearance of parasites, resulting in longer periods of illness and continued transmission. The vaccination has an efficacy rate of over 50% and 36% during 12-month and 48-month follow-up periods, respectively. It has led to a reduction of around 30% in hospitalizations caused

by severe forms of malaria, as it specifically targets the hepatic stage of P. falciparum (Hamilton *et al.,* 2023).

2.1.2 Etiology

Incubation periods vary among *Plasmodium* species and can range from 7 to 30 days, with shorter duration seen in *P. falciparum* and longer duration in *P. malariae* infection. It differs among species as follows: *P. falciparum* requires 8 to 11 days, P. vivax requires 8 to 17 days, P. ovale requires 10 to 17 days, *P. malariae* requires 18 to 40 days, and *P. knowlesi* requires 9 to 12 days. The duration of the Plasmodium lifecycle results in the characteristic "malarial paroxysm" characterised by intense fever lasting for several hours, excessive sweating, and then a subsequent decrease in body temperature to normal.The onset and severity of symptoms are usually determined by the amount of parasitemia: symptoms usually appear with a parasitemia of 0.002% in naive individuals and 0.2% in previously exposed patients. Typically, severe infection results in a parasitemia level of 5%. Buck E *et al.,* (2024)

2.1.3 Severe malaria

Severe malaria is characterised by the presence of *P. falciparum* malaria on a blood film, accompanied with indications of gravity or evidence of impaired functioning of important organs in a patient. An acute febrile sickness of significant severity, with an incubation period of at least one week or maybe more, as defined by Milner et al. (2020). Severe malaria is characterized by symptoms such as impaired consciousness or unarousable coma, confusion, prostration, multiple seizures (more than 2 in 24 hours), deep breathing, respiratory distress, circulatory collapse or shock, jaundice, bleeding/clotting disturbance, invasive bacteria co-infection as pulmonary edema, and children are more prone to hepatomegaly and splenomegaly than adults as diagnosed

by radiological examination (WHO, 2021). Laboratory indicators of severe malaria include hypoglycemia (blood glucose levels below 2.2mmol/litre or 40mg/dl), metabolic acidosis (plasma bicarbonate levels below 15mmol/litre), severe normocytic anaemia (hemoglobin levels below 5g/dl, packed cell volume below 15%), haemoglobinuria, hyperparasitaemia, hyperlactatemia (lactate levels above 5mmol/litre), and acute kidney injury defined by serum creatinine levels of 265mmol/liter or higher. Microscopic examination, including thick and thin smears, continues to be the most reliable method for diagnosing malaria. A thick smear prepared with Giemsa stain is used to identify parasites by analyzing lysed red blood cells (WHO, 2021).

2.2 Treatment

One of the fundamental principles of malaria preventive and control measures is the availability of timely and efficient diagnosis and treatment for malaria. Effective malaria management relies on several key principles to prevent illness and death, while minimizing the need for needless malaria medications(Nyeko, Otim, Obiya, & Abala, 2023).

Timely identification and treatment of severe malaria and its related mortality are crucial towards prevention of complications. The main objective in treatment is to avoid mortality, with a secondary objective being prevention of sequelae emerging from prognostic factors such as numerous convulsions. However, provision of high-quality care for fever and malaria is still limited.

Treatment of children diagnosed with malaria should include the administration of suitable antimalarial medications, such as artemisinin-based combination therapy(Lewis et al., 2023). WHO advises that anti-malarial drugs should be delivered intravenously under careful monitoring in a hospital setting. In cases when artesunate injections are not possible for children under the age of 6 with suspected severe malaria, rectal artesunate is recommended as a pre-referral measure. Under the condition that the child is directed to a health center where comprehensive care can be offered, this plays a crucial role in reducing the risk of death or permanent disability up to 50% (WHO, 2023). Therefore, definitive management of severe malaria involves both targeted anti-malarial medications and prompt supportive therapy.

2.2.1 Pharmacological treatment

It involves use of parenteral medications and later orals depending on the patient"s condition. IV artesunate replaces oral therapy for the first 24 hours. This should be continued for up to 7 days while parasitemia and ability to tolerate oral medications is assessed daily according to (Weiland, 2023). Most countries in Europe use both first and second line medications. Intravenous artesunate (60%) as well as Quinine (40%) as first line medications according to (Kurth *et al.,* 2017).

In Kenya according to (Akech *et al.,* 2020) , (Amboko *et al.,* 2022)first line treatment for severe malaria comprises of: Artesunate 3.0 mg/kg body weight for children below 20kgs and 2.4mg/kg for those weighing above 20kgs. It is given intramuscularly or intravenously at the time of admission (time = 0), 12th hour and 24th hour thereafter,it is administered once daily until the patient is able to swallow and tolerate.

According to (Amboko *et al.,* 2022), another alternative treatment option for severe malaria is quinine, which is administered at a rate of 20 mg/kg body weight upon

admission (either by divided intramuscular injection or IV infusion), followed by 10 mg/kg body weight every 8 hours; the infusion rate should not surpass 5 mg/kg body weight per hour. Another option is Artemether, which is administered at a rate of 3.2 mg/kg body weight intramuscularly (IM) and then 1.6 mg/kg body weight daily.

2.2.2 Supportive management

Timely supportive therapy involves preventing hypoglycemia by administering a rapid and concentrated dose of dextrose over a period of 3-5 minutes. The recommendation is to administer a typical dosage of 0.5–1ml/kg of 50% dextrose diluted with an equivalent amount of normal saline by gradual intravenous infusion over a period of several minutes in children. Whenever intravenous access is not feasible, a sugar solution is administered using a nasogastric tube and blood sugar levels checked 2 to 4 hourly during the treatment period, especially in unconscious patients (WHO, 2018).

According to (Maitland, 2015) Convulsions are managed with a benzodiazepine which is administered as a gradual intravenous infusion at a dosage of 0.15ml per kilogram per body weight. Intra-rectal administration of Diazepam (0.5–1.0mg/kg body weight) is used in cases when injection is not feasible. Incases where convulsions persist, a second dose is administered 10 minutes after the first one. For persistent convulsions, progress to the second line of treatment, Phenobarbitone, with a loading dose of 15mg/kg IM, followed by a daily dose of 5mg/kg for 48 hours. Close monitoring is necessary due to the recognized adverse effect of respiratory distress associated with these drugs (WHO, 2023; Patel, Dunican, & Cunnington, 2020). In the case of a severe anaemia patient with a hemoglobin level below 5 g/dl, the patient is transfused with 20 ml/kg of whole blood (or 10 ml/kg packed cells) based on a standard volume. Patient's level of consciousness is monitored by either Blantyre or Glasgow coma

scale and vital signs. Fluid intake, and output is also crucial, particularly with transfusion to prevent fluid overload. Regular monitoring of blood glucose levels and subsequent malaria blood test within 12 to 16 hours after starting treatment. Assessment of hemoglobin levels and complete blood count are necessary to exclude any other infection and also to track the effectiveness of treatment(Maitland, 2015) .

2.3 Association between child characteristics and quality clinical case management of severe malaria

The prevalence of malaria among boys and girls under 5 years old in sub-Saharan Africa varies based on seasonal dynamics. Some studies indicates that malaria typically hampers some important processes based on the specific period of ‘’brain development at which the infection is contracted, and these impairments may not become apparent until a child reaches an older age. Thus, the age at which malaria infection occurs is a crucial determinant of cognitive impairment (Rosa-Goncalves, Ribeiro-Gomes, & Daniel-Ribeiro, 2022) Malaria Indicator Survey (MIS) 2021 in Nigeria revealed that 22% of children tested positive for malaria parasites between the age range of 6 to 59 months, as determined by microscopy findings. Of the children, those who were 2 years old and less had a far greater likelihood of contracting malaria, at 50.85%, compared to those who were 3 years old or older. In Uganda, malaria incidence is considerably higher among male children compared to girls. Notably, among the 147 individuals assessed, 55% were male and 45% were female. The median age of the patients was 60 months, as reported by (Moffitt, Olupot-Olupot, Onen, and O'Brien in (2023).

Although most research focuses on school-age children, children under the age of five with pre-existing conditions such as malnutrition, systemic disorders like anaemia, and respiratory system disorders are more susceptible to malaria infections and

complications. According to Sarfo et al. (2023), malaria attacks are more frequent and severe in younger children, and the cognitive effects may be more severe in children under five years old. When controlling for socioeconomic level, length-for-age Z-scores, anemia status, and other factors, malaria in children under two years old in Zanzibar and Tanzania was linked to reduced motor activity, lower language scores, and delayed initiation of walking (Paton *et al.,* 2021). A study conducted in Malawi that examined the epidemiology and trends of malaria in children revealed a higher prevalence of malaria in males (51.4%) compared to females (48.6% a). Additionally, the study revealed a greater percentage of malaria morbidity among children aged above 24 months but less than 59 months, as well as a few among those aged 60 months (Gondwe *et al.,* 2021). In a study conducted in Malawi by Chilanga, Collin-Vezina, MacIntosh, Mitchell, and Cherney (2020) on the factors influencing and the frequency of malaria in children, it was found that slightly over half, specifically 50.9%, of the participants were males. Furthermore, children aged 12 to 23 months were consistently more susceptible to malaria compared to other age groups. There was a slight but non-significant sex difference in malaria mortality, males had a 1.04 (95% CI 0.96–1.12) hazard ratio compared to females. This can be compared to the under-5 mortality rate for all causes in Kenya 2013 where a significant sex imbalance was observed (75 per 1000 person years for males and 66 per 1000 person years for females)There might be several reasons for the sex differences in mortality, the Kenya Malaria Indicator Survey from 2015 showed that overall, females under 5 years of age are slightly more likely to sleep under a bed net, with 59.1% of females sleeping under any type of bed net, compared to 56.7% for males [(Unicef, 2015)

2.4. Caregiver and Healthcare provider characteristics influencing quality

clinical case management of children with severe malaria

2.4.1 Caregiver characteristics

The child healthcare-seeking framework, as described by(Treleaven, 2019), outlines a sequence of steps in the care process. These steps include caregivers' capacity to identify and respond to illness, seek guidance and negotiate access to healthcare services, communicate with community-based health promoters, and ultimately receive formal technical services from professionals.

According to (Sarfo et al., 2023), the incidence of malaria in sub-Saharan Africa remains at a significant level, with rates ranging from 0.07 to 80.3% among children under the age of 5. The risk factors for malaria infection among this group are mostly ascribed to inadequate caregiver education, low economic status of family members, and limited awareness on malaria. A significant factor influencing health service utilization is age, particularly among individuals aged 36 to 45 years who prefer to seek medical care earlier than younger age groups. This has a significant adverse effect on the quality of care(Odimbe & Atuhairwe, 2021)..

The study conducted by(Gondwe et al., 2021) found that children with caregivers aged 30 to 39 years had a lower likelihood of receiving a malaria diagnosis compared to children with caregivers older than 40 years. These findings disprove the idea that children born to teenage moms (16-19 years old) are more susceptible to malaria diagnosis compared to those born to older mothers. These findings indicate that children born to both teenage moms and older mothers may be susceptible to negative health consequences. The study conducted by Shah, Emina, Eckert, and Ye (2015) in several countries in Sub Sahara Africa found that the education level of caregivers is a significant predictor in prompt management of children under 5 years old. Notably, Kenya and Madagascar had a higher proportion (49.1%) of women who had

completed at least secondary education receiving timely medical care compared to those with lower levels of education. Recent research by Odimbe and Atuhairwe (2021) has revealed that the likelihood of malaria in children under 5 years old decreases as moms age. Poverty, proximity to health facilities, transportation costs, and long queues have been identified as factors that contribute to increased waiting times in healthcare facilities. These factors lead individuals to seek services at informal settings without access to knowledgeable professionals and supportive facilities, which ultimately compromises the quality of care (Nwaneri & Sadoh, 2020). This aligns with the findings of (Mpimbaza *et al.,* 2019), which indicate that the duration of time caregivers of pediatric patients spend seeking suitable treatment depends on two crucial choices: firstly, determining when to address the condition and secondly, deciding where to seek treatment. These issues have mostly been ascribed to factors such as inadequate education of caregivers, low economic status, limited understanding of malaria, growing reliance on traditional care, and unfavorable encounters with healthcare facilities. Regarding education, over 50% of caregivers who achieved a tertiary level of education chose to use health facility services, in contrast to those with lesser levels of formal education. Hence, caregivers who have completed at least post-secondary education are more inclined to commence treatment in the formal sector for their children with symptoms of fever, as opposed to those with lower levels of education. According to a study by Odimbe and Atuhairwe (2021), 60% of caregivers aged 36-45 years sought malaria treatment for their under-five kid in a formal health facility in Uganda. In contrast, only 28.8% of caregivers aged 18-25 years availed themselves of such therapy. (Dougherty and colleagues, 2020) Internationally, particularly in Nigeria, families with low socio-economic status are less inclined to actively pursue and obtain suitable medical care and treatment for

their ill children. Equally, women who have not received formal education have lower levels of seeking suitable care in comparison to those who have received education.

2.4.2 Healthcare provider factors

An essential aspect of successful malaria case management is conducting malaria parasite testing on all patients who exhibit clinical symptoms related to malaria. Additionally, it is crucial to promptly provide the prescribed treatment for malaria, which includes identifying and treating severe cases of malaria, intervening promptly, and ensuring effective management, particularly for children under the age of 5. Implementing confirmatory diagnostics and guaranteeing the correct dosage of quality-assured first-line antimalarials enhances the effectiveness of malaria treatment and decreases the likelihood of drug resistance (Sarfo *et al.,* 2023). As stated by Leslie et al. (2016), the effective management of malaria cases in children relies on several factors. In low- and middle-income countries, the commonly employed methods to enhance and improve the quality of health service delivery include in-service training and supportive supervision of healthcare professionals.To uphold high standards in managing cases of children under five in Bangladesh, IMCI training combined with regular support supervision can sustain enhancements in the quality of child healthcare in healthcare institutions, especially among personnel with limited pre-service training (Hoque *et al.,* 2014).

A study conducted in Afghanistan on the impact of training on the quality of care for children found that IMCI training provided to healthcare providers generally had a beneficial influence on the quality of care for children under 5 years old. Therefore, this study aims to support the substantiation of diagnoses and treatment of IMCI associated diseases in relation to the accurate diagnosis and treatment of pediatric

diseases (Tawfiq, Alawi, & Natiq, 2020). Cohen's 2020 study revealed a correlation between malaria investigations and antimalarial prescription with clinical management of malaria in children under 5 years. However, findings from other studies indicated no link between malaria training and quality of care for malaria. These studies concluded that training had a minimal impact on the management of malaria by healthcare professionals.

Data from (Bawate, Callender-Carter, Nsajju, & Bwayo, 2016) indicates a notable disparity in the quality of care between healthcare professionals (HCP) who underwent training on malaria management and those who did not get ongoing medical education on the subject. Corroborating these results, Riley et al. (2016) agreed that participating in malaria case management training was three times more likely to enhance understanding of malaria therapy and, consequently, adherence to malaria treatment recommendations. Okitawutshu et al. (2022) suggested that HCPs, particularly those working in higher-level institutions, should undergo continuous medical education sessions on the significance of following guidelines for managing fever. The objective of these sessions is to decrease the occurrence of complications after the treatment of severe malaria cases. In a study conducted in Kenya, Riley et al. (2016) evaluated the use of national malaria treatment guidelines among HCPs. The researchers found that while there was a high level of awareness of these guidelines, only 47% of healthcare providers actually followed them by administering the appropriate first line treatment for malaria.

The study conducted by Kwateng et al. (2015) found that community health nurses were three times more inclined to adhere to malaria treatment recommendations compared to other carders. In Ghana, according to a study by Bawate et al. (2016),

43% of patients with severe malaria received the recommended course of treatment. In contrast, almost 24% of patients with negative malaria blood slide were given anti-malarial medication that went against the treatment expectations outlined in national guidelines.

Riley et al. (2016) shows that a lot of people in Kenya knew about the national malaria treatment standards. Nevertheless, a mere 47% of HCPs delivered the proper initial therapy for malaria. The findings of the study highlighted limitations in the compliance with malaria testing and treatment procedures, since around 33% of children who tested positive for malaria were administered doses of malaria that were lower than expected (Macarayan *et al.,* 2020). In Uganda, there were no statistically significant correlations between compliance with new treatment guidelines and variables including the age of the healthcare professional, duration of employment, amount of supervision, educational attainment, and the age of the care recipient. This study revealed a deficiency in the implementation of malaria treatment recommendations at an optimal level. According to Okitawutshu et al. (2022), deliberate measures are therefore desperately needed to improve compliance with the National guideline.

2.5 Influence of health system factors on quality clinical case management of children with severe malaria

An integral element of health systems that improves the provision of high-quality services is the presence of laboratory facilities that provide precise diagnosis of malaria cases. Studies suggest that the presence of laboratory services at the primary level of healthcare is important for the effective management of malaria. Inadequate laboratory capacity hinders healthcare professionals' ability to assess the quality of clinical care for malaria, resulting in patients being treated for malaria in violation of

national guidelines (Kwarteng *et al.,* 2015). The authors (Fomba *et al.,* 2020) argue that the effective use of verifying diagnostics and ensuring appropriate dosage of quality-assured antimalarials consistently enhances the results of malaria management, hence reducing the likelihood of drug resistance. However, the existence of inadequate or deteriorated medications in facilities will always detract from the effectiveness and quality of treatment provision.

Accurate evaluation and treatment of severe malaria necessitate prompt intervention in a well structured healthcare institution. In children under the age of 5, a delay of more than 2 days in accessing treatment after the onset of symptoms generally leads to a worsening of the disease, resulting in higher mortality rates. Therefore, it is crucial to provide prompt and thorough disease care, as malaria is a medical emergency. Nevertheless, the care of severe malaria remains below the established norm in the majority of malaria-endemic areas. The assessment of treatment success largely relies on the immediate arrival to the hospital during the first day of symptom onset, together with the presence of skilled professionals and necessary resources/facilities (Nwaneri & Sadoh, 2020).

Hospital laboratories frequently encounter stock shortages of malaria quick diagnostic tests and artesunate are forced to work for a restricted duration. Additionally, the staff-to-patient ratios can also hinder the timely administration of drugs. Equally, enhanced nurse-to-patient ratios and sufficient availability of artesunate would enable more timely administration of medication and effective monitoring of patient condition. Implementing this sequence ensures that patients will achieve improved results, ultimately enhancing the probability of complete recuperation. (Moffitt and colleagues, 2023) The study conducted by Otambo et al. (2022) found that frequent delays in microscopic examination of blood smears were caused by inconsistencies in

staff availability, insufficient laboratory supplies, power outages, and excessive patient intake. These factors are indicative of a high likelihood of misdiagnosis rates. These findings align with a study conducted by Cohen et al. (2020), which also found that the presence of laboratory facilities and sufficient supply of anti-malarial medication are significant indicators in assessing the quality of care in the treatment of severe malaria. Their investigation revealed that more than two-thirds of the establishments surveyed had malaria diagnostic equipment and anti-malarial medications accessible at their premises. A crucial measure to provide optimal treatment in the management of all types of malaria, particularly in children, is to guarantee a sufficient supply of diagnostic equipment and drugs.

(Elnour *et al.,* 2019) conducted a facility assessment to evaluate the readiness for competent management of malaria in terms of the presence of appropriate personnel, laboratory services, medical equipment, and sufficient supplies of anti-malarial medications. All the facilities included in their investigation were equipped with malaria microscopy and rapid diagnostic testing (RDT). At least 85% of the hospitals indicated insufficient availability of the first-line anti-malarial medications, Artemether-Lumefantrine.

(Bamiselu et al., 2016) investigated the adequacy of health institutions in Uganda for offering high level quality care in the management of severe malaria. Identified insufficient preparedness of the hospital to deliver high-quality care. A mere 12 out of 83 facilities had access to Malaria Diagnostic test kits, while appropriate microscopes for Malaria Blood Flow (MBF) were mostly found in facilities with in-patient units. Furthermore, he noted a deficiency of blood transfusion services in the majority of in-patient hospitals, which therefore affects the supportive treatment of severe malaria. A strong predictor of clinical prognosis in patients of severe malaria is anaemia. In

contrast, a study carried out in Nigeria found that more than 75% of public health facilities had access to Rapid Diagnostic Test (RDT) kits. However, these facilities had a limited availability of anti-malarial drugs, which subsequently affected the quality of care given to patients being treated for malaria.

The ability of a facility to deliver care relies on four essential elements: the presence of laboratory kits, sufficient availability of first contact drugs, skilled healthcare personnel, and effective utilization of information resources during care provision (Cohen *et al.,* 2020).The study conducted by Okitawutshu et al. (2022) examined the management of severe malaria cases in Ugandan health institutions. The research findings suggest that the management of severe malaria in healthcare institutions in Uganda was sub-optimal, highlighting the challenges of effectively controlling severe malaria in resource-constrained environments. Triage and emergency care, referral procedures, diagnostic and treatment quality, medication and supply availability, training, and support monitoring were identified as areas in need of urgent intervention.

The 47 county referral institutions in Kenya were evaluated for their commodity status in order to deliver high-quality in-patient malaria case management(Zurovac et al., 2018). Despite the sufficient availability of first line artesunate in most health facilities, researchers noted that severe malaria case definition and treatment posters were present in over half of the pediatric wards in the 47 county referral hospitals. Nevertheless, they noted recurrent deficiencies of malaria diagnostic kits in over 30% of healthcare facilities, therefore impeding prompt diagnosis, which is crucial for the efficient treatment of severe malaria.

In a survey undertaken to evaluate the readiness of Kenya's healthcare systems to handle cases of malaria in patients receiving inpatient care. Per national malaria

guidelines (Zurovac *et al.,* 2018), malaria microscopy was consistently used in both surveys as the gold standard for diagnosing malaria. To ensure high-quality service delivery in patient management, it is recommended to use supportive supervision as a quality improvement intervention. This intervention should be implemented among healthcare providers to enable them to provide quality services, hence enhancing their performance and motivation (Bailey *et al.,* 2016).

2.6 Mediating factors

Adherence to malaria treatment guidelines is critical for providing high-quality care to patients who present with severe malaria. Provision of quality is evaluated according to; accurate diagnosis achieved through necessary testing, comprehensive case examination, administration of the appropriate drug and dose, and subsequent follow-up (Riley *et al.,* 2016).

In a study conducted by Bawate et al. (2016) investigated the several factors that impact the compliance of public healthcare workers in Kamuli District with national malaria treatment recommendations for malaria management. Among the 241 cases documented, 50.6% adhered to the national recommendations for treating malaria. Of the cadres evaluated, the level of adherence achieved by registered nurses was superior than that of the other cadres. Nonetheless, the lack of malaria treatment work aides in consultation rooms and the failure to attend facility malaria-specific continuing medical education (CME) sessions were also linked to reduced compliance with standards.

In a cross-sectional survey conducted by (Kwarteng *et al.,* 2015) across 20 health facilities in Ghana to evaluate adherence to mandatory malaria treatment guideline, the researchers identified a significant lack of compliance with certain aspects of

malaria testing. It was found that a mere 39.8% of patients exhibiting symptoms consistent with severe malaria underwent a diagnostic test (either an RDT or a Malaria Blood Slide). This finding contradicts the anticipated principle that anti-malarial treatment should be administered exclusively to patients who test positive for malaria. With this in mind, a considerable percentage of patients were administered anti-malaria medication without undergoing malaria testing, which may have adverse effects on the standard of care delivered to individuals suffering from severe malaria. Additionally, it was noted that approximately 61% of the patients included in the research were administered malaria treatment without undertaking the mandatory malaria test. A comparative analysis of compliance levels was conducted among various health facilities, revealing that public health facilities exhibited a higher degree of adherence in comparison to their private counterparts.

Comparable results were published by (Cohen *et al.,* 2020), who identified notable disparities between public and private health facilities with regard to adherence to malaria treatment guidelines. (Kwarteng *et al.,* 2015) found that community health nurses exhibited a threefold increase in adherence to malaria treatment guidelines compared to practitioners in other healthcare professions.

2.7 Research Gap

Notwithstanding the rise in the availability of malaria diagnostics and efficient antimalarial drugs, the research has shown that there are still notable deficiencies in the quality of care for children with severe malaria. Furthermore, there exist knowledge gaps on the correlation between malaria infection and inadequate child development, namely in children aged 0 to 59 months. Gaining insight into the role of malaria infection is crucial since developmental deficits experienced during the first five years of life can have long-lasting consequences in terms of scholastic

achievement and adult education, among other factors.

Thirdly, there are few research on the use of a standard instrument for assessing and evaluating the management of severe malaria in various countries to determine the quality of care for malaria in typical cases.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter describes the specific strategies and procedures that was used in data collection and analysis in order to answer the research questions. The chapter focuses on the study design, study site, study population, sampling technique, sample size determination, data collection procedure, research instrument, reliability and validity, data management, analysis and presentation and ethical consideration.

3.2 Research Design

This was a descriptive cross-sectional study conducted between April and August 2023 at Kombewa and Chulaimbo Hospitals in Kisumu County which sought to determine the level of quality of care in clinical case management of severe malaria among children 6 to 59 months by healthcare providers in Kisumu County.

Quantitative technique

Survey for client record forms was used to assess current practice at the study area to compare with the standard guidelines for the management of severe malaria in children.

Qualitative technique

An indepth interview with HCPs was done to assess knowledge, attitude and practice using self administered questionnaires having both open and closed questions. Key informant interviews were also conducted.

3.3 Study Area

This study was conducted in 2 main health care facilities namely Kombewa County Hospitaland Chulaimbo County Hospital located within Kisumu West sub-county. Cross-sectional survey was conducted at health facilities that provide in-patient care. The survey was planned to coincide with period of high malaria transmission season from April to August. Thetwo facilities are level 4 facilities and are in an area known to have high prevalence of malariaof up to 28.1 % (Jenkins *et al.,* 2015). The high prevalence of malaria in the area provides a suitable background for assessing clinical

case management of severe malaria in pediatric population. Kombewa County Hospital is located within Seme area, opposite the KEMRI- Walter Reed Project. Total bed capacity of 80 with a pediatric capacity of 20 beds. The total staff establishment was 53 comprising of 39 nurses, 9 clinical officers, 5 medical officers. Chulaimbo County Hospital is located within Maseno area along Kisumu-Busia Road. Chulaimbo has a bed capacity of 30 with staff establishment of 44 comprising of 28 nurses, 15 clinical officers, 1 medical officers. Thelocation of the two facilities is indicated in map in Appendix 2.

3.4 Study Population

For quantitative data, the study population was children 6 to 59 months admitted at Kombewa and Chulaimbo County Hospitals with severe malaria. For qualitative data, the study subjects were healthcare providers directly involved in the management of children with severe malaria. They include; nurses, clinical officers, and doctors.

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

i. Cases of pediatric patients admitted with severe malaria as per case definitions for severe malaria with clinical features:

- Positive Malaria Test on RDT or Malaria Blood Film
- More than 2 convulsions
- Prostration
- Impaired consciousness or unarousable coma

- severe pallor or Low Haemoglobin count of less than 5g/dl
- Hypoglycaemia (Glucose <2.2 mmol/L)

ii. The health care providers (nurses, clinical officers and medical officers) who have worked in the study area for more than 6 months and are willing to participate.

3.5.2 Exclusion Criteria

i. Patients admitted with severe form of malaria with co-infections

ii. Healthcare providers (nurses, clinical officers and medical officers) with mental instability.

3.6 Sample Size

3.6.1 Sample Size for children with severe malaria

Prevalence of malaria in the study area is 19% (KMIS 2020). In a period of one year , Kombewa County Hospital reported 1000 cases of malaria out of which 151 were cases of severe malaria between April and July 2023. While Chulaimbo had 800 cases of malaria with 143 cases of severe malaria over the same period. The final sample size was determined using Cochran formula for sample size determination as indicated below.

n0: Cochran's sample size computed using the formula for ideal sample size;

For calculation of an infinite population

$no = (Z^2 * P * (1-P)) / E^2$

$no = (1.96^2 * 0.5 * 0.5) / 0.05^2$

$= 3.8416 * 0.25) / 0.0025$

$= 0.9604 / 0.0025$

no= 384.16

Therefore,

n = no/1+no/N

n = 384/1+384/1800

n = 317

Add 10% for records with incomplete information (32)

Final sample of records to be reviewed was 349.

3.6.2 Sampling of Severe Malaria cases to be reviewed

Proportionate Stratified sampling method was applied in selecting cases of severe malaria to be reviewed from each of the facility as show in the table below:

Table 3.1 Sampling of Severe Malaria

Facility	Proportion of Malaria cases based on 1800 cases	Sample size per facility based on final sample size of 349
Kombewa	1000 (55.5%*)*	0.56×349= 194
Chulaimbo	800 (44.4%*)*	0.44 × 377 =155
Total	1800	349 Cases with severe malaria

3.6.3 Sample Size for Healthcare Providers

Healthcare providers (doctors, nurses, clinical officers) from the two health facilities were sampled to take part in this study. The final sample size for healthcare providers was determined using Yamane method $\{n = \frac{N}{1+N(_e)^2}\}$for sample size calculation for descriptive studies (Yamane, 1976). This method is suitable for determining sample size for descriptive studies without using population proportion.

Where $\{ n = \frac{N}{1+N\,(_e)^2} \}$

n = the desired sample size

N = the population under study which in this case is 97 (nurses, clinical officers and medical officers) from the two facilities.

e = the desired level of precision arbitrarily taken to be 0.05.

Thus, desired sample size

$$n = \frac{97}{1+97(_{0.05})^{2}}$$

n= 78 healthcare providers.

3.6.4 Sampling Method for Healthcare Providers

Stratified proportionate sampling was used in selecting final participants Proportion of nurses is 58% at Kombewa and 42% at Chulaimbo. Proportion of clinical officers is 38% at Kombewa and 62% at Chulaimbo. Proportion of medical officers is 83% at Kombewa and 17% at Chulaimbo. These proportions have been used in determining final sample size from each facility as per table below.

Table 3.2 Sampling Method for Healthcare Providers

	Overall Sample					Sample per facility	
	Kombewa	Chulaimbo	Total	%	Sample	Kombewa	Chulaimbo
Nurses	39	28	67	69%	0.69×78=54	0.58× 54=31	0.42× 54=23
Clinical Officers	9	15	24	25%	0.25×78=19	0.38× 19=17	0.62× 19=12
Medical Officers	5	1	6	6%	0.06×78=5	0.83× 5=4	0.17× 5=1
Total	**53**	**44**	**97**	**100%**	**78**	**43**	**35**

3.7 Data Collection Tools

This study used 3 data collection tools to obtain information for use in evaluating the study objectives. Case management information was extracted from patients' hospital records by the trained study staff, and complemented by direct observation and information obtained from resident hospital staff. The main variables extracted included age, sex, weight, dates and times of admission, clinical assessments and laboratory tests with their results, provisional and final diagnoses, treatment provided throughout the patient's admission, and anti malarial prescription.

3.7.1 For objectives 1and 2 Transcription form for Review of medical records

Through review of medical records,the researcher sought to establish the profile of patients with severe malaria, proportion of patients who received care on time and as per WHO guidelines on management of severe malaria. The researcher also obtained information on caregivers' healthcareseeking behavior especially on time taken to seek care and use of herbal medications as well self-treatment prior to seeking care. For HCPs, medical records was done to determine the quality of care in terms of diagnosis, classification, medication (drug used, timing, dosing and frequency) with reference to malaria treatment guidelines on patients who presented with severe malaria . Medical information retrieved included medical history, presenting symptoms, diagnosis, laboratory tests, treatment received, duration of hospitalization and patient status at discharge. No personal identifiable information such as names, telephone contacts or address were collected as part of this study.

3.7.2 Structured Questionnaire

For Objective 2 (HCPs), pre-tested structured questionnaire was used to collect information on interventions implemented by healthcare providers Questionnaire is organized into three sections. The first section covered demographic information of

HCPs. Second section covered practices on management of severe malaria. Third section covered healthcare workersknowledge assessment on management of severe malaria.

3.7.3 Observation Checklist on Health-facility

For objective 3, a standard WHO provider assessment survey checklist was used to assess on health facility on availability of Rapid Diagnostic kits, laboratory capacity to perform malaria blood film, capacity to perform test for full hemogram (diagnosis of anaemia) and to assess stock availability especially on anti-malarial medicines available at the facilities. Health facility checklist was used to establish interventions implemented at health facility, availability of IEC material (guidelines) on management of severe malaria.

3.8 Reliability and Validity of Research Instruments (TRANSCRIPTION FORM)

3.8.1 Validity

Two aspects of validity were considered when developing the records transcription form for content and face validity. Content validity ensured that all items in transcription form represent domain on quality case management of severe malaria. To achieve this, items added in the transcription form were retrieved from literature review and subjected to quantitative review of items. Face validity was done to establish the relevance, clarity, simplicity, and comprehensiveness of the items included in the transcription form.

3.8.2 Reliability

Transcribing data from patient medical records requires a high level of accuracy and reliability. Medical information obtained included both patient and caregiver's profile and premedication, doctor's notes about their diagnosis and treatment. Maintaining up-

to-date medical records helps doctors and patients stay in the loop regarding pediatrics condition, treatment, care, and preventative measures.

Incomplete or missing data, lost medical records, failing to record new medical problems or symptoms, and mistakes caused by illegible handwriting are among the most common causes of inaccurate healthcare documentation thus compromising care. At both hospitals, the researcher was able to get patient records from the files. Accurate and comprehensive information about the child's medical history, including their symptoms, diagnoses, treatments, and outcomes, were available in the files. Complete patient records were the only ones that were evaluated to the best of our ability.

3.8.3 Data Collection Techniques

Researcher used 2 research assistants in data collection. The research assistants were trained onstudy proposal, data collection tools and participant information and consent form. They were trained on procedures for data extraction from medical records. The following procedures wasapplied during data collection: Researcher first obtained consent from participants prior to enrolling them into the study.

3.9 Data Management

All questionnaires and data collected was checked for completeness prior to data analysis. Collected data is kept confidential in a lockable cabinet. Data from the questionnaires and retrieved medical information was entered into a Microsoft Excel package and kept in a password protected computer. Questionnaires and medical information collected were anonymized and will be retained for a period of up-to 5 years or longer period as required.

3.10 Data Analysis

Objective 1 and 2, for quantitative data analysis, descriptive statistics (mean, frequency, and proportions) and frequency tables were used to characterize patient, caregiver, healthcare providers, and health system attributes and frequency tables. For objective 3, Qualitative information from key informant interviews were reviewed and emerging themes identified. The identified themes were then coded into categories based on responses obtained from respondents. Relational Content analysis used explore how malaria management practicesaffects compliance to case management of severe malaria at the respective hospitals. Through relational content analysis the researcher sought to determine the extent to which hospital practices are related to quality of care in case management of severe malaria. Analytical methods such as the chi-square test and logistic regression were employed to evaluate the relationship between independent variables and the quality of case management for children with severe malaria. The significance level was established at 95% (p-value < 0.05). The analysis was conducted using version 27 of the Statistical Package for Social Sciences (SPSS).

3.11 Ethical Considerations

The scientists obtained ethical approval from the institutional ethics review committee of Masinde Muliro University of Science and Technology (MMUST IREC- 027/2022) (check appendix). Furthermore, the Jaramogi Oginga Odinga Teaching and Referral Hospital Institutional Ethics Review Committee (JOOTRH ISERC) granted ethical approval. Acquired research authorization from the National Commission of Science, Technology and Innovation (NACOSTI Ref No: 311812) (check appendix**)**. Administrators of Kombewa and Chulaimbo sub-County Hospitals granted authorization in writing. Three ethicalprinciples of respect, beneficence and justice

were adhered to during conduct of this study. Details on these principles are documented in participant information and informed consent document . In summary the following was applied:

3.11.1 Respect for humanity

Respect in research requires that participants be approached and allowed to make autonomous decision on whether they want to participate in this study or not. The researcher used participant information sheet to provide details and procedures involved in this study. Participants were allowed time to review the information and make independent decision to participate. Participants were informed of their right for voluntary participation and right to withdraw fromthe study at any time. The researcher used a written consent. The participants signed on the informed consent form to indicate the voluntary decision to take part in this study.

3.11.2 Beneficence

This principle requires that any research involving human participants should always ensure that participants are not subjected to any form of harm. These includes both physical, psychological, economic, and social harms. To minimize physical harms there were no invasiveprocedures being done as part of this study. Participants were allowed to complete questionnaires at their convenient time without being subjected to undue pressure from the researcher. The items/research questionnaires were framed in a non-judgmental manner.

Respondents were informed to withdraw when uncomfortable and the interviews rescheduled if possible.

3.11.3 Justice

The principle of justice requires that all research participants be treated fairly and be given equalchance to contribute to research. At all times the researcher ensured there is fair treatment and right to privacy for all participants in the study. To ensure right to privacy no personal identifiable information such as names, addresses, or telephone contacts were collected as partof this study. The questionnaire was only identified using participant study number code whichcannot be linked to any study participant.

3.11.4 Informed consent

This study implemented the four components of informed consent: providing required information to the participants; allowing voluntary involvement, ensuring participants' comprehension of the information, and granting the choice to withdraw at any point without any negative consequences. An explicit written consent was obtained by the researcher. Participants were asked to sign and date an informed consent paper to indicate their agreement to take part in this study.

3.11.5 Confidentiality

Personal identification has been deliberately omitted, and participant information has been restricted to the researchers only. The participants were guaranteed that the report will be disseminated to Masinde Muliro University of Science and Technology, the sub-county administrators, and other stakeholders dedicated to supporting decisions about the enhancement of services provided at Kombewa and Chulaimbo County Hospitals.

CHAPTER FOUR

RESULTS

4.1. Overview

“This chapter presents a detailed account of the findings derived from the data analysis report. A thematically structured analysis of qualitative and quantitative data is used in this study to investigate the quality of clinical case treatment of severe malaria in children aged 6 to 59 months by HCPs in Kisumu County. This thematic exploration includes an examination of social demographic characteristics and their relation to clinical case management of severe malaria in children 6 to 59 months, association between child characteristics and quality clinical case management, influence of caregiver characteristics and quality clinical case management of children with severe malaria, the relationship between health care provider factors and quality clinical case management of children with severe malaria and the influence of health system factors on quality clinical case management of children with severe malaria.

4.2. Children characteristics and Caregiver and heath care provider characteristics of the respondents

The study sought to know the children characteristics, Caregiver/healthcare provider characteristics of the respondents in the study. The results are illustrated in Table 4.1.

Table 4.1: Characteristics of sick-children (objective 1)

Variable	Categories	n	%
Child characteristics			
Age of child in months	< 12.00	58	16.9
	≥ 12.00	286	83.1
Mean age±SD (in months)		12.58±1.67 (1.30 – 59.00)	
Gender	Male	174	50.6
	Female	170	49.4
Child diagnosis	Severe malaria	344	100.0

As shown in Table 4.1, the study comprised a total of 344 clinical observations of unwell children from two Hospitals under study. The average age of the children was 12.58 months, with a standard deviation of ± 1.67. The maximum age varied from 1.30 to 59.00 months. Despite the higher proportion of males (50.6%) compared to girls (49.4%), there was no significant difference. An overwhelming majority of the children (63.4%) were admitted to Kombewa Sub county hospital, while only 36.6% were admitted to Chulaimbo Sub-county hospital. Each of the 344 youngsters received a diagnosis of acute malaria

Table 4. 2 Caregivers and healthcare providers characteristics (Objective 2)

Variable	Categories	n	%
Caregiver characteristics			
Age in years	15 - 24	44	12.8
	25 - 34	174	50.6
	35 - 44	106	30.8
	≥ 45	20	5.8
Mean age±SD (in years)		32.33±7.13 (18.00 – 56.00)	
Level of education	Primary	50	14.5
	Secondary	74	21.5
	Tertiary	220	63.9
Marital status	Single	77	22.4
	Married	260	75.6
	Separated	3	0.9
	Divorced	1	0.3
	Widow	3	0.9
Heathcare provider characteristics			
Facility	Kombewa	67	55%
	Chulaimbo	35	45%
Cadre	Nurses	52	67%
	Clinical officers	20	26%
	Medical officers	2	3%
	43	4	5%
Level of education	35	6	8%
	52	65	83%
	Undergraduate	5	6%
	post-graduate	2	3%
Years of experience	Less than 1 year	35	45%
	2-4 years	27	35%
	5-7 years	7	9%
	8-10 years	2	3%
	More than 10 years	7	9%
IMNCI	NO	32	41%
	YES	46	59%
Attendended CME on malaria or in-service training	No	3	4%
	Yes	75	96%

Table 4.2 above presents demographic profile of sampled healthcare workers.With regard to caregiver characteristics, average age was 32.33 years with a standard deviation of ±7.13 and ranged between 18.00 to 56.00. Most of the caregivers were in the age group of 25 – 34 (50.6%). Nearly two-thirds (63.9%) had attained tertiary level of education and (75.6%) married. More than half were aged above 36 years old. More

than two-thirds were nurses. More than three-quarter of respondents only had Diploma level of training. Majority at 45% (n=35) had less than one year of work experience. More than half at 59 % (n=46) had received refresher training on Severe Malaria as compared to 41 % (n=32) who had not received refresher training on Severe Malaria. More than 96% of respondents had attended continuous medical education/in-service training on malaria.

4.3. Availability of medications for management of severe malaria per facility in the study area

Healthcare providers were asked about the availability of medications for management of severe malaria. The feedback is summarized in Table 4.3.

Table 4. 3: Availability of medications for management of severe malaria by type of hospital

Variable	Categories	Kombewa		Chulaimbo	
Patient purchase medicine for malaria	Yes	4	23.5	13	76.5
	No	122	37.3	205	62.7
Facility stocking	Observed/verified malaria testing equipment	0	0.0	62	100.0
	Has observed/verified appropriate antimalarial (ACT) in stock	9	50.0	9	50.0
	Has both appropriate malaria testing equipment and antimalarial treatment	117	44.3	147	55.7

From Table 4.3, patient purchase of medicine for malaria was not common in the two facilities: out of the 17 who purchased 4 were from the county and 13 from sub-county hospital. Largely, the two facilities had both appropriate malaria testing equipment and antimalarial treatment as reported for the county (44.3%) and sub-county (55.7%)

hospitals.

4.4. Clinical management of severe malaria by type of health facility

The study sought to establish the clinical management of severe malaria by type of health facility. Table 4.4., presents clinical management of severe malaria by type of health facility.

Table 4. 4: Clinical management of severe malaria by type of health facility

Variable	Categories	Kombewa (%)		Chulaimbo (%)	
Tests done	Microscopic	89	32.8	182	67.2
	Rapid Diagnostic Test	36	58.1	26	41.9
	Test not done	1	9.1	10	90.9
Medications given	Oral ACT	2	1.6	124	98.4
	Artemether Injection	124	56.9	94	43.1
Microscopic blood test diagnosis and appropriate medication	Yes	88	48.3	94	51.7
	No	38	23.2	124	76.5

From the results in Table 4.4, microscopic tests are more commonly done in Kombewa sub-county facility (67.2%) than in Chulaimbo sub county hospital. Among children who received Artemether injection, 56.9% were from county hospital compared to 43.1% from sub-county facility. Receipt of both microscopic blood test diagnosis and appropriate medication which has been used as a measure of quality case management is somewhat higher in Kombewa sub-county (51.7%) than in Chulaimbo sub county hospital.

The study findings align with those of Cohen et al. (2020), indicating that a significant proportion of children diagnosed with malaria in the 9 sub-Saharan African nations assessed did not get the necessary recommended treatment. Although there has been substantial improvement in clinical management in recent years and a favorable

correlation with the stocking of key commodities, significant quality discrepancies persist in the nations examined.

4.5. Relationship between child/ caregiver characteristics and quality clinical case management of children with severe malaria

The study aimed to evaluate the quality of clinical case management for children diagnosed with severe malaria by assessing the presence of a blood test diagnosis and the administration of suitable antimalarial therapy. The findings obtained using logistic regression are displayed in Table 4.5.

Table 4. 5: Logistic regression results on patient and caregiver correlates with microscopic blood test and recommended medication for severe malaria

Variables	Categories	Total	Recommended test and medication for severe malaria		OR	95% CI	P value
			Yes	No			
		n	%	%			
Child characteristics							
Gender	Male	174	46.6	53.4	0.6	0.4 – 0.9	**0.017**
	Female	170	59.4	40.6			
Age group in months	< 1	58	53.4	46.6	1.0	0.6 – 1.8	0.928
	≥ 1	286	52.8	47.2			
Caregiver characteristic							
Age group in years	< 25	44	77.3	22.7	3.5	1.7 – 7.3	**0.0005**
	≥ 25	300	49.3	50.7			
Level of education	Primary	50	84.0	16.0	5.8	2.6 – 12.7	**< 0.0001**
	Secondary and above	294	47.6	52.4			
Marital status	Married	260	51.5	48.5	0.8	0.5 – 1.3	0.371
	Single, separated, divorced, widow	84	57.1	42.9			

Objective 1, Table 4.5 shows that male children had lower (40%) likelihood of receiving a blood test diagnosis and an adequate antimalarial medication compared to females. (hazard ratio: 0.6; 95% confidence interval: 0.4 – 0.9; p = 0.017). For objective 2, the odds ratio (OR) for children with younger caregivers under 25 years

old was 3.5 times higher than for children with older caregivers (OR: 3.5; 95% CI: 1.7 – 7.3; p = 0.0005) to receive a blood test diagnosis and an adequate antimalarial medication. Furthermore, children whose caregivers had completed primary level education had a greater likelihood of being diagnosed with a blood test and obtaining the correct antimalarial medication, compared to children whose parents had a higher level of education (OR: 5.8; 95% CI: 2.6 – 12.7; p < 0.0001). Neither the age group of the child nor the marital status of the caregiver produced statistically significant findings.

Consequently, the hypothesis Ho1: There is no correlation between child characteristics and the quality of clinical case management of children with severe malaria is rejected, since there is indeed a significant correlation between child characteristics and the quality of clinical case management of children with severe malaria.

Furthermore, the null hypothesis (Ho2) that there is no correlation between caregiver characteristics and the quality of clinical case treatment of children with severe malaria is also rejected due to the statistical significance ($p<0.05$) of the examined features.

4.6. Relationship between provider/ health systems characteristics and quality case management of children with severe malaria

The study also investigated the prospective processing of quality, which included the stocking of essential malaria commodities in facilities and the training of health workers. This was achieved through interviews with nurses, laboratory technologists, and pharmaceutical technologists. The results of logistic regression are reported in Table 4.6.

Table 4. 6: Logistic regression results on provider and health system correlates with microscopic blood test and recommended medication for severe malaria (objective 2 and 3)

Variables	Categories	Total	Recommended test and medication for severe malaria		OR	95% CI	P value
			Yes	No			
		n	%	%			
Healthcare provider characteristics							
Health provider characteristics	Nurse	52	67.0	33.0	0.9	0.6 – 1.4	0.654
	Doctor, Clinical Officer	22	54.6	45.4			
Trained on IMCI	Yes	46	45.5	54.5	0.4	0.3 – 0.7	**0.0005**
	No	32	64.7	35.3			
In-service training on management of severe malaria/ CMEs	Yes	75	47.5	52.5	0.6	0.4 – 0.9	**0.017**
	No	3	60.6	39.4			
Facility stockings	Appropriate testing equipment and antimalarial treatment	264	54.6	45.4	1.3	0.8 – 2.9	0.269
	Either has observed / verified appropriate malaria testing equipment and antimalarial treatment in stock	80	47.5	52.5			
Basic package available	Parenteral Artemisinin	292	46.2	53.8	0.1	0.04 – 0.24	< **0.0001**
	Other antimalarials	52	90.4	9.6			

For objective 2 on HCPs characteristics, Table 4.6 above shows that Children who received care from healthcare providers with IMCI training were 60% more likely to have benefited from quality case management of severe malaria compared with those cared for by non-trained IMCI care providers (OR: 0.4; 95% CI: 0.3 – 0.7; p = 0.0005).

Likewise, children who received care from healthcare providers with in-service training in management of severe malaria in children were 40% more likely to have benefited from quality case management of severe malaria compared with those cared for by providers with no in-service training in the same area. (OR: 0.6; 95% CI: 0.4 – 0.9; p = 0.017). This leads to the rejection of Ho_3: There is a no relationship between healthcare provider factors and quality clinical case management of children with severe malaria The odds of receiving a blood test diagnosis and an appropriate antimalarial was 3-fold higher for children admitted in county as opposed to those in sub-county hospital (OR: 3.0; 95% CI: 1.9 – 4.9; p < 0.0001).

Table 4.7 Relationship between facility preparedness and quality clinical case management of children with severe malaria

Variables	Categories	Total	Recommended test and medication for severe malaria		OR	95% CI	P value
			Yes	No			
		n	%	%			
Facility stockings	Appropriate testing equipment and antimalarial treatment	264	54.6	45.4	1.3	0.8 – 2.9	0.269
	Either has observed / verified appropriate malaria testing equipment and antimalarial treatment in stock	80	47.5	52.5			
Basic package available	Parenteral Artemisinin	292	46.2	53.8	0.1	0.04 – 0.24	**< 0.0001**
	Other antimalarials	52	90.4	9.6			

For objective 3 on availability of basic package, There was negative association between basic package availability and children receiving a blood test diagnosis and an appropriate antimalarial where the odds were significantly lower where parenteral Artemisinin was available compared to where other antimalarials were available (OR: 0.1; 95% CI: 0.04 – 0.24; $p < 0.0001$). Thus Ho_4: There is a no relationship between health system factors and quality clinical case management of children with severe malaria is rejected.

4.7. Relationship between patient, caregiver, provider characteristics and quality clinical case management

The study sought to get the estimates from multiple logistic regression with the main predictors of children admitted with severe malaria in the two facilities receiving a blood test diagnosis and an appropriate antimalarial. The indicators being gender, age for child characteristics and level education of the caregiver, type of antimalarials available. The results are summarized in Table 4.8

Table 4. 8: Multiple logistic regression results on patient, caregiver, provider correlates with microscopic blood test and recommended medication for severe malaria

Characteristics	AOR	95% CI	P value
Child characteristics			
Male (ref: Female)	1.75	1.09 – 2.81	**0.021**
Caregiver characteristics			
< 25 years (ref: ≥ 25 years)	0.37	0.16 – 0.84	**0.018**
Primary level education (ref: Secondary and above)	0.42	0.17 – 1.01	**0.053**
Health facility characteristics			
Artemisinin (ref: Other antimalarial)	0.59	0.43 – 0.81	**0.0012**

From Table 4.8, Child characteristics has a p=0.021which is p<0.0.5 significant level leading to the rejection of the Ho_1: There is a no relationship between child characteristics and quality clinical case management of children with severe malaria. This implies that the different tested child characteristic that include gender has a significant relationship with quality of clinical case management of children with severe malaria.

Caregiver characteristics registered a p=0.018 according to the tested characteristics of age and level of education. The level is below the significance level of 0.05 leading to the rejection of Ho_2: There is a no relationship between caregiver characteristics and quality clinical case management of children with severe malaria. This therefore implies that there is a significant relationship between caregiver characteristics and quality of clinical case management of children with severe malaria.

According to the table, healthcare provider characteristics showed a p<0.05 leading to the rejection of the Ho_3: There is a no relationship between healthcare provider factors and quality clinical case management of children with severe malaria.

4.8.1: Key Informant Interviews on Compliance with Malaria management

The results of key informant interviews were decoded and organized into themes based on the key interview questions. The emerging themes include identifying case of severe malaria and burden of malaria cases in the hospital; perceptions on quality of management of severe malaria; challenges experienced by healthcare workers in management of severe malaria; adherence and needs for improvement in management of severe malaria.

Key informant interview demonstrated that healthcare workers can easily identify a child presenting with severe malaria. As expressed by informants:

> *"Most children with severe malaria present with convulsions, pallor and prostration". "We can easily tell from such symptoms that child has severe malaria".*

Observations from interview is consistent with information obtained from review of medical records in which many children diagnosed with severe malaria presented with convulsions and prostration. On malaria burden, the informants indicated:

> "*Malaria cases differ from months to months but we see many cases of Severe Malaria from April to July each year*".

4.8.1b: Perceptions on quality of management of severe malaria

Key informant interview demonstrated in general that healthcare workers understood the need for quality management of severe malaria.

> Most informants indicated: *"We strive to ensure that patients especially children receive timely care when they present at the hospital and at times we would initiate treatment when we suspect severe malaria".*

From the interview it was clear that healthcare workers were conversant with

guidelines on management of severe malaria.

> *"From outset we have to perform rapid diagnostic test to confirm that patient has malaria and thereafter administer the right dose of initial treatment and subsequent doses" Healthcare* workers indicated that: *"The treatment guidelines are very helpful in ensuring that patient received quality treatment and it is our joy when patients recover and are discharged within shortest time possible".*

On healthcare worker (clinical officer) indicated that speed and timing is key in ensuring survival:

> *"We should not waste time when patient presents with cardinal signs of severe malaria, do a rapid malaria test and initiate treatment even as we await other laboratory tests."*

4.8.1c: Challenges experienced by healthcare workers in management of severe malaria

On overall the interview demonstrated many positive experiences of healthcare workers in management of severe malaria, however, certain challenges were noted to exist which impacts quality of care of severe malaria. Some of these challenges include delays in seeking care; poor compliance to medication; lack of transfusion and lack of supplementary laboratory tests.

> As expressed by healthcare workers: *"We see many parents coming to hospital very late many days after child has been sick" "Parents buy time by giving children self-medication at home and by that time the child is very sick".*

On poor compliance with treatment: *"Most mothers don't finish the malaria dose after discharge, and this makes us to see many children being readmitted with malaria".*

On blood transfusion high number of admissions with severe anemia puts a strain on healthcare service as blood might not be readily available:

> *"At times we experience many admissions of children with severe anemia, we have to carefully choose who is transfused and who is managed with hematinic, although we would prefer to have all children with receive blood transfusion as they need".*

On laboratory testing, healthcare workers expressed concern that at-times there are no reagents to perform certain tests such as full-hemogram and clinical chemistry for patient monitoring. 2 hospital administrators and 2 medical superintendents expressed concern that*:*

> *"We rely on rapid diagnostic test and malaria blood film which don't require expensive reagents". At times there are no reagents to perform full-hemogram and serum chemistry tests when we need to monitor patient progress and response to treatment or to identify what other conditions patients might be suffering from"*

4.8.1d: Adherence and needs for improvement in management of severe malaria.

Further discussions revealed that to improve adherence to treatment guidelines on severe malaria would improve when there is adequate training of front-line health care workers, sensitizing community on recognizing danger signs for malaria and improving supplies for hospital use. The medical officer in-charge commented that:

> *"When we train healthcare workers on case identification and treatment procedures, we increase the chances of greater compliance with malaria treatment guidelines*"

Participants indicated that health education at discharge will help reduce cases of poor

compliance to medication post discharge and reduce cases of re-admissions from Malaria. As observed by medical officer and nursing officer in-charge:

> "*We have to strive and educate parents/caregivers on need to complete prescribed doses and not to stop treatment when they see a child begins to feel better, doing so will help reduce re-admission from treatment failure"*

Interviewees indicated that hospital of late has not experienced shortage of malaria drugs and rapid diagnostic tests and if such is sustained then patients can be assured of quality care on management of severe malaria. The respondents indicated:

> "*On overall we don't experience shortage of anti-malarial and rapid diagnostic tests. At least we can correctly identify those who are sick from malaria and administer the required medication"*

CHAPTER FIVE

DISCUSSION

5.1 Overview

This chapter sought to highlight the discussion from the research findings which were based on factors influencing the quality clinical case management of severe malaria among children 6 to 59 months by HCPs in Kisumu County and identify areas of intervention.

The study findings indicate that malaria continues to be a significant public health concern for children under the age of five. The research area demonstrated an overall prevalence of malaria of 24.3% (95% CI = 18.6–28.8) among children who sought medical attention. A myriad of elements operating at various levels within the health system influence the quality of treatment delivered during a sick child visit. This study investigated not only the quality but also the interaction of parameters at various levels that influence the provision of high-quality child care. Numerous noteworthy discoveries were identified during the examination, which encompassed elements concerning the client, caregiver, healthcare provider, and facility.

The analysis of the study results was grounded on the research goals of the study conducted to assess the quality of clinical case treatment of severe malaria in children under the age of five by HCPs in Kisumu County.

5.2. Demographic Characteristics

The study findings indicate that malaria continues to be a significant public health concern for children under the age of five. Overall, malaria was present in 24.3% (95% CI = 18.6–28.8) of children who sought medical attention in the study area. A myriad of elements operating at various levels within the health system influence the quality

of treatment delivered during a sick child visit. This study investigated not only the quality but also the interaction of parameters at various levels that influence the provision of high-quality child care. A comprehensive analysis uncovered several noteworthy findings pertaining to the client, carer, healthcare professional, and institution.

The study findings were discussed in relation to the research goals concerned with the quality of clinical case management of severe malaria in children under the age of five at Kombewa and Chulaimbo sub-county hospital in Kisumu County. Analysis of the demographic data reveals that 83% of the participants in the study were older than 12 months. This finding supports a study conducted in Malawi by (Chilanga, Collin-Vezina, MacIntosh, Mitchell, & Cherney, 2020) on the factors and frequency of malaria in children. The study revealed that children aged 12 to 23 months were more frequently affected by malaria compared to children of other age groups. These findings align with a research conducted in Nigeria by(Isiko et al., 2024) Isiko et al., which revealed that 22% of children tested positive for malaria parasites between 6 and 59 months based on microscopy results. Specifically, children aged 24 months and below had a significantly higher risk of malaria at 50.85% compared to those aged 36 months and above.

Furthermore, from the study findings, children who were treated by healthcare professionals who had received IMCI training and in-service training in malaria case management were 60% and 40% more likely to have benefited from high-quality case management of severe malaria, respectively, compared to those who were cared for by non-trained healthcare professionals. Consistent with a research conducted in Afghanistan on the impact of training on the quality of care for children, IMCI trainings provided to healthcare professionals typically resulted in a favorable

outcome for the quality of care for children under 5 years old. Therefore, it facilitates the validation of diagnoses and treatment of Illnesses associated to Motor Control Impairment (IMCI) in relation to the accurate diagnosis and treatment of children diseases(Tawfiq, Alawi, & Natiq, 2020).

5.3. Discussion of findings as per study objectives

5.3.1. Objective 1: Association between child characteristics and quality clinical case management of children with severe malaria

The study results indicated that there was no significant disparity in the proportion, although there were a higher number of males (50.6%) compared to girls (49.4%). The p-value for child traits is 0.021, which is below the significance level of 0.0.5. This findings concur with an investigation carried out in Uganda on compliance with malaria treatment recommendations as part of a quality standards initiative found that malaria prevalence is somewhat higher in male children (55%) compared to girls, with a median age of 5 years (Moffitt, Olupot-Olupot, Onen, & O'Brien, 2023). It agrees with (Gondwe et al., 2021) findings on the epidemiology and trends of malaria in children in Malawi support the notion that malaria is more prevalent in boys (51.4%) compared to females (48.6%) per 1000 members of the population. The prevalence of malaria morbidity varied by age, with a greater proportion observed in children aged 24 months and older, but less so in those aged 59 months and 60 months. These findings are contrary to a study conducted in Central Malawi by (Chilanga et al., 2020) on the factors influencing and the frequency of malaria in children, it was found that children aged 12 to 23 months are more susceptible to malaria compared to other age groups who are less likely to contract the disease. Concerning gender, the prevalence was higher among male children at 50.9% compared to females at 49.1%.

5.3.2. Objective 2: Association between caregiver and healthcare provider

characteristics and quality clinical case management of children with severe malaria

Nurses constituted the largest percentage of health care providers interviewed (64.8%) in this investigation. Data analysis of the study revealed that children who were treated by healthcare professionals with IMCI training and those with in-service training in the management of severe malaria in children were 60% and 40% more likely to have benefited from high-quality case management of severe malaria, respectively, compared to those handled by untrained healthcare professionals. The results of this study align with a previous study conducted in Afghanistan on the impact of training on the quality of care for children. The study found that providing IMCI training to healthcare professionals generally provided a beneficial outcome in terms of improving the quality of care for children under 5 years old. This, in turn, facilitated the accurate diagnosis and treatment of childhood diseases associated to IMCI, as stated by (Tawfiq et al., 2020). Furthermore, it supported the research conducted by (Bawate, Callender-Carter, Nsajju, & Bwayo, 2016) which revealed a notable disparity in the quality of care between HCP who underwent training on malaria management and those who did not get ongoing medical education on the subject. It also agrees with a study conducted by (Riley et al., 2016) revealed that participating in malaria case management training was three times more effective in enhancing understanding of malaria therapy and, consequently, adherence to malaria treatment recommendations.

One other significant discovery from this study is, the impact of caregivers' age on the utilization of health care services for their children. The OR for children with younger caregivers under 25 years old was 3.5 times higher than for children with older caregivers (CI: 1.7 – 7.3; p = 0.0005) to have gotten a blood test diagnosis and

an adequate antimalarial medication. This finding aligns with the study conducted by (Isiko et al., 2024), which revealed that caregivers aged 15 to 24 years accounted for 17.18% of individuals seeking health services, while those aged 35 to 49 years included 15.33%. Consequently, this age group must access healthcare services in specialized institutions to receive high-quality treatment. Contrary with (Odimbe & Atuhairwe, 2021) findings in a study done in Uganda which indicated that 60% of caregivers aged 36 to 45 years are likely to seek health services at an early stage, which justifies the need for prompt examinations, in contrast to younger age groups. The findings of (Gondwe et al., 2021) support the idea that children born to caregivers aged 30 to 39 years are less likely to be diagnosed with malaria compared to children born to caregivers older than 40 years. This contradicts the hypothesis that children born to adolescent mothers (16-19 years) are more susceptible to malaria diagnosis than those born to caregivers older than them. These findings indicate that children born to both teenage moms and older mothers may be susceptible to negative health consequences. Findings of the study indicated that children whose caregivers had completed primary level education were more likely to have a blood test diagnosis and an adequate antimalarial treatment compared to children whose parents had a higher level of education (OR: 5.8; 95% CI: 2.6 – 12.7; $p < 0.0001$). The present research results are in opposition to a study undertaken by (Shah, Emina, Eckert, & Ye, 2015), which revealed that the educational attainment of caregivers is a significant determinant in the timely care of children under the age of 5 in some countries within Sub-Saharan Africa. In Uganda, a higher proportion (49.1%) of women who had completed at least secondary education received timely treatment compared to those with lower levels of education. Additionally, 50% of caregivers who made use of services for children under 5 years of age achieved a tertiary education level. In essence, caregivers who

have completed at least post-secondary school education are more inclined to commence treatment in a formal sector as opposed to those with lower levels of education. A study conducted by(Dougherty et al., 2020) in Nigeria found that those who have never received formal education have lower rates of seeking suitable medical attention for their ill children compared to those who have attended school.

5.3.3. Objective 3: Association between health system factors and quality clinical case management of children with severe malaria

Study findings showed appropriate malaria testing equipment and antimalarial treatment. More than half (67.2%) of the study subjects received appropriate microscopic tests and antimalarial drugs (Artemether injection). This proposition is a finding supported by (Fomba et al., 2020) that proper utilization of verification diagnostics and ascertaining proper dosing of quality-assured antimalarials always improves malaria management outcomes thus minimizing the risk of drug resistance. On the other hand, presence of deficient or degraded drugs at facilities will always undermine efficiency and standards of service delivery. Contrary to (Elnour, Alagib, Bansal, Farag, & Malik, 2019) in their study on facility assessment on quality service provision towards management of malaria and found out that nearly all the facilities in their study had malaria microscopy and RDT testing. However, 85% of the facilities reported lack of adequate supply of first line anti-malarial drugs Artemether–Lumefantrine) . Availability of relevant staff, laboratory services,medical equipment, and adequate anti-malarial drugs plays a key role towards quality of care for better outcomes.(Elnour et al., 2019) did facility assessment on preparedness towards quality care management of malaria in terms of availability of relevant staff, laboratory services, medical equipment, and adequate anti-malarial drug stocks. Most importantly, Lack of laboratory limit's ability of HCPs to determine the quality of

clinical care of malaria as patients end up being treated for malaria clinically against the national guidelines

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Overview

This chapter provides recommendations based on the study findings and conclusion. The recommendations have been illustrated as per objectives.

6.2. Conclusion

The purpose of this study was to evaluate the factors influencing quality of clinical case management of severe malaria in children aged 6 months to 59 months by healthcare providers in Kisumu County.

For objective 1. In child characteristics influencing quality case management, there is significant higher percentage of severe malaria in male children as compared to their female counterparts

Objective 2. On caregiver and healthcare provider characteristics

This study findings emphasizes the significance of strategies in clinical care, guaranteeing that specific child variables are taken into account to boost the effectiveness of therapy and enhance health results. Based on the data, caregiver characteristics showed a significance in age and degree of education. This indicates that there is a significant relationship between caregiver characteristics (specifically age and education level) and the efficacy of clinical case management for children

with severe malaria. This observation underscores the necessity for focused educational and support initiatives aimed at caregivers in order to enhance clinical outcomes.The results revealed that, factors such as the HCPs' level of training, years of experience, adherence to clinical guidelines, and availability of resources significantly impact the quality of clinical case management leading to the rejection of Ho_2: There is a no relationship between caregiver/HCP characteristics and quality clinical case management of children with severe malaria.

There was negative association between basic package availability and children receiving a blood test diagnosis and an appropriate antimalarial where the odds were significantly lower where parenteral Artemisinin was available compared to where other antimalarials were available (OR: 0.1; 95% CI: 0.04 – 0.24; $p < 0.0001$). Thus Ho_3: There is a no relationship between health system factors and quality clinical case management of children with severe malaria is rejected. The significant negative association between the availability of parenteral Artemisinin and the quality of clinical case management for severe malaria highlights critical gaps in the health system. Addressing these gaps requires a multifaceted approach that balances the availability of advanced treatments with essential diagnostic and therapeutic practices. By doing so, health systems can enhance the overall quality of care for children with severe malaria, ultimately improving health outcomes and reducing malaria-related morbidity and mortality.

6.3. Recommendations

i. Developing and implementing training programs for HCPs that emphasize the importance of diagnostic testing alongside treatment. Establishing robust monitoring and evaluation frameworks to regularly assess the quality of malaria

case management and adjust strategies accordingly.

ii. Embracing programmed support supervision, mentorship, continued medical education and on-the-job training to inexperienced employees emphasizing on adherence to clinical guidelines among healthcare providers to effectively uphold and ensure the maintenance of high standards of care.

iii. Adopting a holistic approach to health system strengthening that integrates effective antimalarial treatments with rigorous diagnostic and treatment protocols.

iv. Lastly, further research studies to determine the patient satisfaction levels as well as staff training needs assessment.

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APPENDIX I :ASSESSMENT OF THE QUALITY OF CLINICAL CASE MANAGEMENT OF SEVERE MALARIA IN UNDER FIVE CHILDREN IN KISUMU COUNTY, KENYA

S/N	Child characteristics			Child diagnosis	Caregiver characteristics			Type of health	Patient purchasing malaria medications		Purchasing medical supplies	Facility stocking	Basic package	Provider characteristics			Clinical management	Medication	Outcome
	Admission number	Date of admission	Sex: 1=M 2=F	1=Severe malaria 2= Gastrointestinal infection 3= Respiratory infection	Age	Level of education 1=None 2=Primary 3=Secondary 4=College / University	Marital status 1=Single 2=Married 3=Separated 4=Divorced 5=Widow	1= County referral 2= Sub-county hospital 3= Health centre	1=Yes 2=No	Type of medications 1=Purchased medications 2=Quinine 3=Antibiotics 4=Haematenics	1=Purchased medical supplies 2=IV cannula 3=Syringes 4=Giving sets 5=Gloves	1=Has observed/verified malaria testing equipment 2=Has observed/verified appropriate antimalarial (ACT) in stock 3=Has both	1= injectable quinine 2= Intravenous fluids, 3=50% dextrose 4= blood for transfusion	1= Doctor 2= Clinical 3= Nurse	Training in IMCI 1= Yes 2= No	Received in-service training on severe malaria case management in	Tests done 1=Microscopy 2=Rapid diagnostic test 3=Not done	1=Oral ACT 2= parenteral artemisinin 3=Rectal artemisinin 4=Artemether injection injectable quinine 5=Sulphado	1= diagnosis based on blood test 2= receipt of appropriate antimalarial

												appropriate malaria testing equipment and antimalarial treatment 4=Stockout for > 1 week	5= IV giving sets 6= blood transfusion set 7= Syringes			last 12 months 1= Yes 2= No		xine-pyrimethamine tablets 6=Other (chloroquine, sulfadoxine pyremethamine, amodiaquine, quinine tabs)	

Tests done: 1= Blood test diagnosis (child's malaria diagnosis was based on either a blood slide microscopy test or a rapid diagnostic test) 2=No test done.

Medication: 1= Appropriate (child received either an oral ACT, parenteral artemisinin, or injectable quinine) 2= Other specify (chloroquine, sulfadoxine pyremethamine, amodiaquine, quinine)

(Transcription form was adopted and modified from M. Saliku,2020)

APPENDIX II: Participant Information Sheet and Informed Consent Form

Title of Study: Factors influencing quality clinical case Management of severe malaria among children aged 6 months to 59 months by healthcare providers in Kisumu county.

Dear Participant, I am **ROSE NYANGWESO MAOGA** a student from Masinde Muliro

University of Science and Technology, School of Nursing and Midwifery pursuing a Master ofScience in Nursing. As a partial requirement for the award of my degree, I am required to carryout a research study on ".**Factors influencing quality clinical case Management of severe malaria among children aged 6 months to 59 months by healthcare providers in Kisumu County.**

What Is This Study About: The researcher listed above is interviewing healthcare workers and collecting data on management of severe malaria. The purpose of the research is to find out about healthcare workers knowledge and practices on management of severe malaria. Participants in this research study will be asked questions about their day-to-day practices on management of severe malaria in children below 5 years of age.

What Will Happen if you decide to be in This Research Study: If you agree to participatein this study, the following things will happen: Participation in this study is voluntary. Your responses will be used for research purposes only. Your name will not be used anywhere in this study, nor are you required to fill it anywhere in this questionnaire. Please note that there are items that require you to write your response. You may end the interview at any time. If you have any questions about this study, you can contact the research office using contacts below. If you agree to participate in this study, the following things will happen: You will be interviewed by a trained interviewer in a private area where you feel comfortable answering questions. The interview will last approximately 15-30 minutes.

Confidentiality and Anonymity: Confidentiality will be maintained and the information you provide will only be used for the intended purpose of the study. In ensuring confidentiality your name will not be required on any questionnaire, only numbers will be assigned to questionnaires and the units you are working on. Only consent forms will require your name and signature. All materials used during the study will be under lock and key and only the personnel involved in this study will have access to them. All data collected will be pooled together and published without using any names to assure anonymity. Data collected will also be stored in a password protected computer and only study personnel will have access to the data.

Benefits and Risks: There is little or no direct benefit for you in taking part in this study. Youwill not be paid for taking part and you are also not going to pay to participate in this study. The information from this study will help better explain clinical management of severe malariaand may also help us better understand barriers compliance with guidelines on management ofsevere malaria. One potential risk of being in this study is loss of privacy. We will keep everything you tell us as confidential as possible as described in the section on confidentiality and anonymity. Also, answering questions in the interview may be uncomfortable for you. If there are any questions you do not want to answer, you can skip them. You have the right to refuse the interview, or any questions asked during the interview.

Voluntary Participation: Participation in this study is voluntary. Refusal to take part will notattract any penalty. You retain the right not to participate in this study at any-time. You also retain the right to withdraw from the study at any time without any consequences. Thank you in advance for your cooperation.

If you wish to speak to someone independent of the study, or if you have any questions about your rights in the study, you can contact: the Secretary, Masinde Muliro University of Science and Technology-Institutional Ethics Review Committee. Tel 056-31375. Email: ierc@mmust.ac.ke.

If you have questions about your participation in the study, or please call or contact: Rose Maoga: Tel: 0720 953 631 Email: bephine2010@gmail.com

Participant Consent Statement

I have read this consent form or had the information read to me. I have had the chance to discussthis research study with researcher. I have had my questions answered in a

language that I understand. The risks and benefits have been explained to me. I understand that my participationin this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

Participant printed name	**Participant signature / Thumb stamp**
Date:	

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name:_____Date: _

Signature _____

APPENDIX III: Facility Stock status Checklist

A	Availability of services	YES	NO	Comment
B	**DIAGNOSTICS**	**Available**	**Not Available**	
1	Does this facility do any haemoglobin testing on site			
1a	Hematology analyzer			
1b	HemoCue			
2	Does this facility do any blood glucosetesting in the facility?			
2a	Glucometer			
2b	Glucometer test strips			
3	Does this facility have a blood chemistryanalyzer that provides serum creatinine, LFTs and glucose?			
4	Does this facility do any MALARIA tests(microscopy or mRDT) on site, i.e., in the facility?			
5	Do you use malaria rapid diagnostic test todiagnose malaria at this laboratory/service site?			
6	Indicate type of malaria rapid diagnostic test (RDT)			

7	Facility has training manual, poster orother job aid for using malaria rapid diagnostic test?			
8	Does the facility perform any of the following malaria tests or equipment isused in the facility			
8a	Giemsa Stain			
8b	Field Stain			
9	Does this facility perform diagnostic X- rays, ultrasound			
C	**MEDICINES AND COMMODITIES**			
Are any of the following antimalarial medicines available in the facility/location today?		**Available**	**Not Available**	
1	ARTEMETHER LUMEFRANTRINE (ALU) 6 TABLETS/PACK			
2	ARTEMETHER LUMEFRANTRINE (ALU) 12 TABLETS/PACK			
3	ARTEMETHER LUMEFRANTRINE (ALU) 18 TABLETS/PACK			
4	ARTEMETHER			

	LUMEFRANTRINE (ALU)24 TABLETS/PACK			
5	QUININE TABLETS			
6	QUININE INJECTION			
7	INJECTABLE ARTESUNATE			
8	ARTESUNATE SUPPOSITORIES / RECTAL ARTESUNATE			
9	OTHER ANTI-MALARIAL MEDICINE[OTHER THAN ARTESUNATE + AMODIAQUINE TABS]			
E	**MALARIA SERVICES**			
1	How many days in a month are malaria services available in this facility?			
2	Do providers in this facility use blood tests to verify diagnosis of malaria, either by microscopy or mRDT?			
3	Do you have a training manual, poster orother job aid for using malaria rapid diagnostic test?			
4	Do you have the national guidelines forthe diagnosis and treatment of malaria available in this service area?			
5	Do you have any other guidelines for the diagnosis and treatment of			

	malaria in thisservice area?			
6	BLOOD TRANSFUSION services are available at this facility			
7	What is the source of the blood that istransfused this facility(REGIONAL BLOOD BANK OR RELATIVES DONATING DIRECTLY OR BOTH)			
8	Is blood that is transfused in this facilityscreened, either in this facility or externally for infectious diseases prior to transfusion?			
9	Has the facility run out of blood for more than one day anytime during the past 3months?			
10	Is there a blood bank fridge or other refrigerator available for blood storage in this service area?(Specify type available			

APPENDIX IV: Key Interview Guide

Welcome and Introduction.

Dear Participant, my name is Rose N Maoga a student from Masinde Muliro University of Science and Technology, School of Nursing and Midwifery pursuing a Master of Science in Nursing. The goal of today's meeting is to discuss your role in providing effective case management of Malaria care at **Kombewa and Chulaimbo Sub-County Hospitals.**

Before we start, I'd like to go around the room and have everyone introduce themselves and tellus what your position at this hospital.

Guidelines

There are no right or wrong answers, only differing points of view. We're tape recording withone person speaking at a time. You will only be identified by your first name, and you are oknot to agree with others, but you must listen respectfully as others share their views. I request that our phones be on silent mode and if you must respond to a call, please do so as quietly aspossible and re-join us as quickly as you can. My role as moderator will be to guide the discussion.

Questions

1. How would you identify a case of severe malaria?
2. What is the malaria disease burden in your hospital?
3. What did you think consists of quality care in management of Severe malaria?
4. What are some of the medications/drugs that are essential in management of severemalaria that are readily available at this hospital?
5. What may contribute to poor compliance with treatment guidelines at your hospital?
6. What is your opinion on quality of care in management of Severe malaria at this facility?
7. What some of the measures in place to improve management of Severe Malaria?
8. Where do you get new information on management of Severe Malaria?
9. What do you like best about management of Severe Malaria at this facility?
10. What needs improvement on management of Severe Malaria at this facility?

11. Which is that one change that you would consider making to improve in quality ofcare in management of Severe Malaria?

Closing Thank you participating in the discussion. Your feedback will be collected and included in a research report (all feedback will be reported anonymously). Your insightand contribution is appreciated. Thanks for your time.

Participant Consent Statement

I have read this consent form or had the information read to me. I have had the chance to discuss this research study with researcher. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

Participant printed name	**Participant signature / Thumb stamp**
Date:	

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher 's Name: _____ **Date**: _____

Signature

_____

APPENDIX V: Questionnaire Adopted and modified (M. Saliku,2020)

Dear Respondents

Dear Participant, I am a student from Masinde Muliro University of Science and Technology, School of Nursing and Midwifery pursuing a Master of Science in Nursing. As a partial requirement for the award of my degree, I am required to carry out a research study on "**.** The results of this survey will be used for academic purpose only. The information we collect from you will not be shown to anyone outside of this project. If you have any question about this study, you can contact the researchers.

Factors influencing quality clinical case Management of severe malaria among children 6 months to 59 months by HCPs in Kisumu County.

Instructions:

- Do not write your name on this questionnaire
- Write your choice of answer in the column labelled Response
- You can consult with researcher if you don't understand any part of a questions

SECTION I: DEMOGRAPHIC INFORMATION			
	QUESTIONS	**OPTIONS**	**RESPONSE**
1	Facility	1. Kombewa **2.** Chulaimbo	
2	Placement	1= Out-patient 2= Paediatric Ward 3. General Ward 4. Immunization unit 5. Other(specify)	
3	Indicate your age?	(1)= <25 years (2)= 26-35 (3)= 36-45 (4)= >45	
4.	Category/cadre of health worker	1= Nursing Officer 2= Clinical Officer 3. Medical officer 4. Specialist Paediatrician	
5	Highest Level of Professional	1= Diploma	

	Education	2= Undergraduate 3= Post-graduate(Masters) 4= Doctorate 5. Certificate level	
6	Refresher training on malaria management in last 2 years	1= Yes 2= No	
7	Attended facility CME on malaria within last one year	1= Yes 2= No	
8	Years of Experience in practice	1= Less than 1 year 2= 2- 4 years 3= 5-7 years 4= 8-10 years 5= More than 10 years	

SECTION II: KNOWLEDGE ON MANAGEMENT OF SEVERE MALARIA

Question	Knowledge Item	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
1	Severe Malaria is characterised with Haemoglobin level of <5g/dl					
2	More than 2 convulsions within 24 hours are a sign of severe Malaria					
3	Deep breathing, respiratory distress is a sign of severe Malaria					
4	Impaired consciousness or unarousable coma with Blantyre coma scale > 3 for children indicates severe malaria					
5	Hypoglycaemia (blood glucose < 2.2mmol/litre or < 40mg/dl) is a sign of severe Malaria					
6	Circulatory collapse or shock, systolic blood pressure < 50mmHg in children is a					

	sign of Severe Malaria					
7	Severe Malaria is characterised with metabolic acidosis (plasma bicarbonate < 15mmol/litre);					
8	Treatment for severe malaria can be started based on clinical features of severe malaria while still waiting for laboratory test results					
9	A positive blood film proves that severe falciparum malaria is the only cause of the severe illness and no other illness should also be considered.					
10	In managing Hypoglycaemia in children 0.5–1ml/kg of 50% dextrose diluted with an equal volume of normal saline given by slow intravenous infusion					
11	Children should be given 20–50ml of 50% dextrose as intravenous bolus					
12	Diazepam can be given intra-rectally (0.5–1.0mg/kg bw) only if injection is not possible.					
13	The most common indication for blood transfusion is severe anaemia (Hb < 5g/dl)					
14	In managing anaemia packed cells (10ml/kg in children) or whole blood transfusion should be given urgently with frusemide					
15	Artesunate 2.4mg/kg IV or IM given on admission (time = 0), then at 12h and 24h, then once a day is the recommended treatment for severe malaria					

16	In reconstitution the vial of artesunate powder should be mixed with 1ml of 5% sodium bicarbonate solution (provided) and shaken 2–3 minutes for better dissolution.					
17	As an alternative to Artesunate, Artemether is given as 3.2mg/kg bw IM on admission then 1.6mg/kg body weight per day					
18	The recommended regimen for Quinine is 20mg /kg on admission (IV infusion or divided IM injection), then 10mg/kg every 8 hours.					

APPENDIX:VI Approval Letter for IERC MMUST

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

Tel: 056-31375
Fax: 056-30153
E-mail: ierc@mmust.ac.ke
Website: www.mmust.ac.ke

P. O. Box 190,
50100.
Kakamega,
KENYA

Institutional Ethics and Review Committee (IERC)

REF: MMU/COR: 403012 Vol 6 (01)

Date: March 23rd, 2022

To: Ms. Rose Nywangweso Maoga,

Dear Madam.,

RE: QUALITY OF CLINICAL CASE MANAGEMENT OF SEVERE MALARIA IN UNDER FIVE CHILDREN IN KISUMU COUNTY.

This is to inform you that the ***Masinde Muliro University of Science and Technology Institutional Ethics and Review Committee (MMUST-IERC)*** has reviewed and approved your above research proposal. Your application approval number is **MMUST/IERC/027/2022.** The approval covers for the period between ***March 23rd, 2022*** to ***March 23rd, 2023.***

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***MMUST-IERC.***
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***MMUST-IERC*** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***MMUST-IERC*** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***MMUST-IERC***.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours Sincerely,

Prof. Gordon Nguka (PhD)
Chairperson, Institutional Ethics and Review Committee

Copy to:
- The Secretary, National Bio-Ethics Committee
- Vice Chancellor
- DVC (PR&I)

APPENDIX VII Approval from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **311812**

Date of Issue: **30/March/2022**

RESEARCH LICENSE



This is to Certify that Ms.. Rose Nyangweso Maoga of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Kisumu on the topic: QUALITY OF CLINICAL CASE MANAGEMENT OF SEVERE MALARIA IN UNDER FIVE CHILDREN IN KISUMU COUNTY for the period ending : 30/March/2023.

License No: **NACOSTI/P/22/16654**

311812

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is Guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014

CONDITIONS

1. The License is valid for the proposed research, location and specified period
2. The License any rights thereunder are non-transferable
3. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research
4. Excavation, filming and collection of specimens are subject to further necessary clearence from relevant Government Agencies
5. The License does not give authority to tranfer research materials
6. NACOSTI may monitor and evaluate the licensed research project
7. The Licensee shall submit one hard copy and upload a soft copy of their final report (thesis) within one year of completion of the research
8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice

National Commission for Science, Technology and Innovation
off Waiyaki Way, Upper Kabete,
P. O. Box 30623, 00100 Nairobi, KENYA
Land line: 020 4007000, 020 2241349, 020 3310571, 020 8001077
Mobile: 0713 788 787 / 0735 404 245
E-mail: dg@nacosti.go.ke / registry@nacosti.go.ke
Website: www.nacosti.go.ke

APPENDIX : VIII Approval letter for Kombewa



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KISUMU

Telegrams: "PRO (MED)"
Tel: 254-057-2020105
Fax: 254-057-2023176
E-mail: kisumucdh@gmail.com

Director of Public Health, Preventive/
Promotion and Environmental Health
P.O. Box 721 – 40100,
Kisumu.

DEPARTMENT OF HEALTH & SANITATION

Our Ref: GN 133 VOL. XI/ (230) **Date:** 7th April, 2022

To
SCMOHs – Kisumu West and Seme

Medsups – Chulaimbo and Kombewa SCHs

RE: APPROVAL TO CONDUCT RESEARCH ON '*QUALITY OF CLINICAL CASE MANAGEMENT OF SEVERE MALARIA IN UNDER FIVE CHILDREN IN KISUMU COUNTY*'

The Department has reviewed and approved this research titled '***Quality of Clinical Case Management of Severe Malaria in under five children in Kisumu County'.***

The Principal Investigator for this study will be ***Rose Nyangweso Maoga***

Kindly accord them all the necessary support.

Regards.

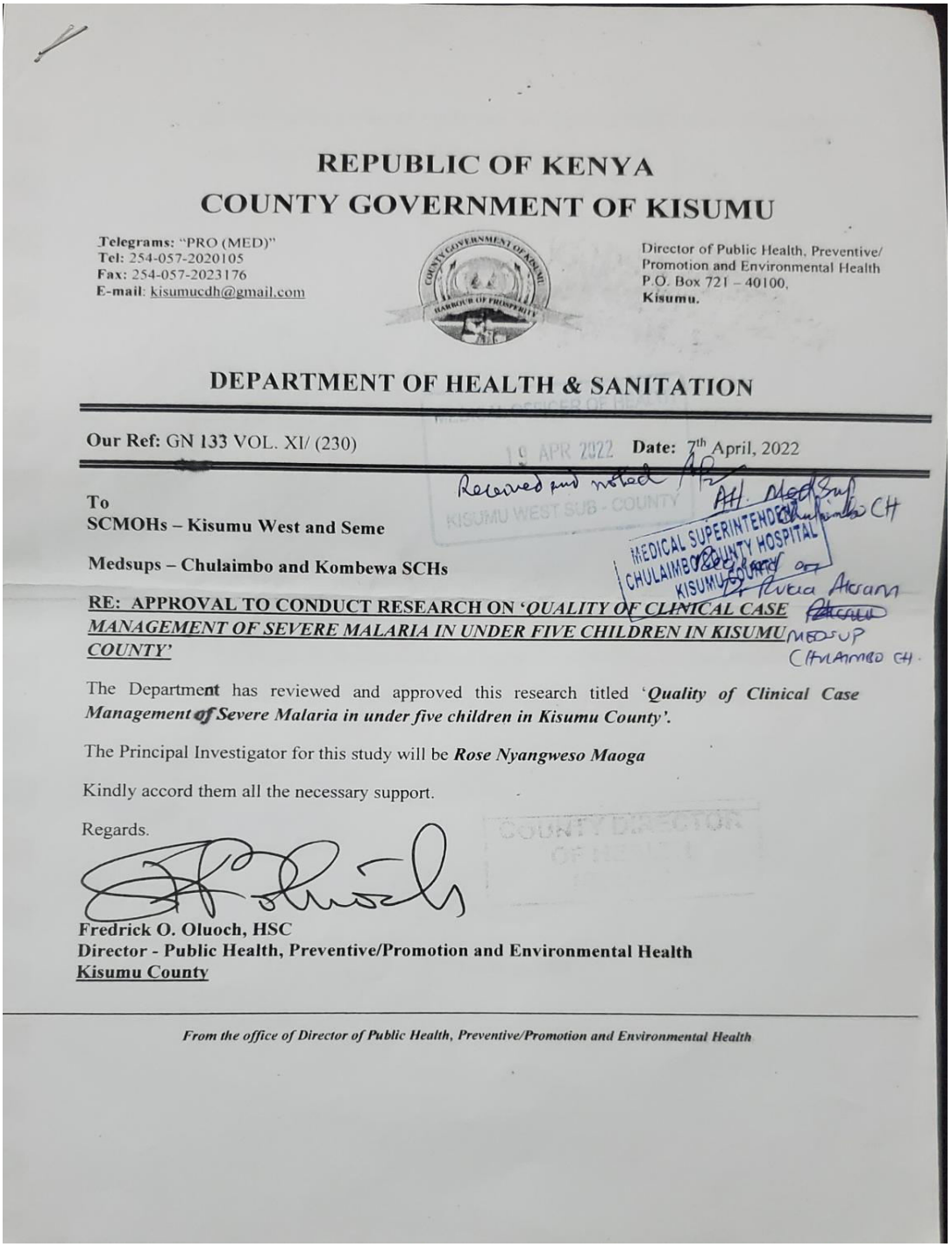
Fredrick O. Oluoch, HSC
Director - Public Health, Preventive/Promotion and Environmental Health
Kisumu County

Dr Vincent

FOR: MEDICAL SUPERINTENDENT
KOMBEWA COUNTY HOSPITAL
P.O.BOX 60-40102 KOMBEWA

From the office of Director of Public Health, Preventive/Promotion and Environmental Health

APPENDIX :IX Approval letter for Chulaimbo



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF KISUMU

Telegrams: "PRO (MED)"
Tel: 254-057-2020105
Fax: 254-057-2023176
E-mail: kisumucdh@gmail.com

Director of Public Health, Preventive/
Promotion and Environmental Health
P.O. Box 721 – 40100,
Kisumu.

DEPARTMENT OF HEALTH & SANITATION

Our Ref: GN 133 VOL. XI/ (230) **Date:** 7th April, 2022

19 APR 2022

Received and noted

KISUMU WEST SUB - COUNTY

MEDICAL SUPERINTENDENT
CHULAIMBO COUNTY HOSPITAL
KISUMU

To
SCMOHs – Kisumu West and Seme

Medsups – Chulaimbo and Kombewa SCHs

RE: APPROVAL TO CONDUCT RESEARCH ON '*QUALITY OF CLINICAL CASE MANAGEMENT OF SEVERE MALARIA IN UNDER FIVE CHILDREN IN KISUMU COUNTY*'

The Department has reviewed and approved this research titled '***Quality of Clinical Case Management of Severe Malaria in under five children in Kisumu County'.***

The Principal Investigator for this study will be ***Rose Nyangweso Maoga***

Kindly accord them all the necessary support.

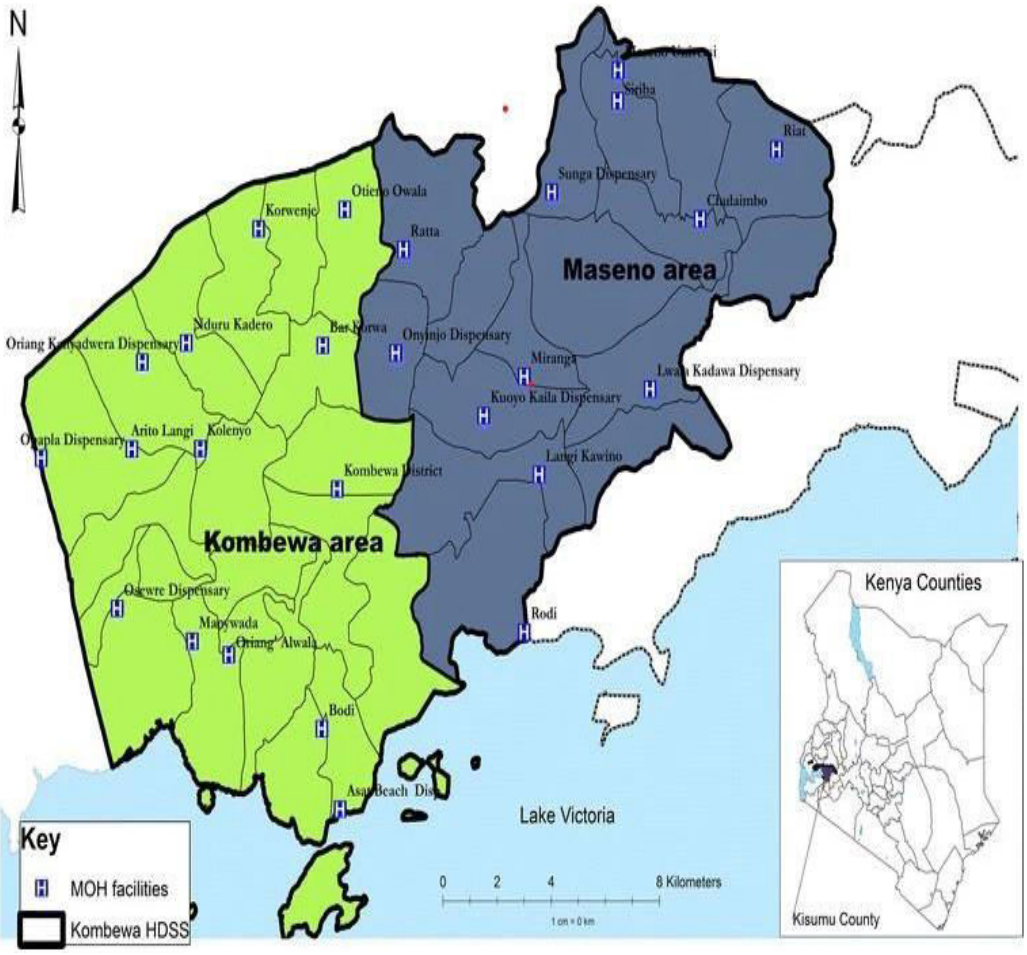
Regards.

COUNTY DIRECTOR OF HEALTH

Fredrick O. Oluoch, HSC
Director - Public Health, Preventive/Promotion and Environmental Health
Kisumu County

From the office of Director of Public Health, Preventive/Promotion and Environmental Health

APPENDIX X: Location of Kombewa and Chulaimbo sub-county hospitals



Map source: Kombewa Health Demographic and Surveillance System