

## Prevalence and Outcome of Malaria at the Tombel Health District: A Retrospective study

### Abstract:

#### Background:

World Health Organisation World Malaria Report estimates that 247 million malaria cases occurred in 2021 with 84 malaria endemic countries, an increase from 245 million (0.033%) in 2020. Malaria in Africa still account for the leading cause of under five mortality, leading to over two-third of malaria death in Sub-Saharan Africa.

#### Method:

This was a hospital based cross sectional study that utilized one year hospital data spanning from July 2022 to July 2023 extracted from the hospital out patients department register for all patients received at the Tombel Health District during that time. Administrative consent was given by the Director of the district hospital as these study did not required an ethical approval. Age, presumptive diagnosis, laboratory investigations, definitive diagnosis and treatment status were the data collected from the registers.

#### Results:

The study had 1177 hospital files (individualized) with majority of the files from 2022 (52.4%) and October 2022, having the highest representation (23.4%). Majority of the participant being female (61.3%). The prevalence of hospital-malaria was 28% with 47.1% of the confirmed cases of malaria requiring admission.

#### Conclusion:

Malaria is still a burden among inhabitants in the Tombel Health District, due to risk factors such as: economic status, poor road, low health personnel, swampy areas, nature of jobs and as well

negatively impact their socio-economic status. More actions are needed to be made among inhabitants at the Tombel Health District to reduce this outcome and prevalence observed.

**Keywords:** Malaria, Outcome status, Health burden, Tombel Health District, Cameroon.

## **INTRODUCTION:**

According to the World Health Organization's (WHO) World Malaria Report, there were an estimated 247 million malaria cases in 2021 with 84 malaria endemic countries, an increase from 245 million (0.033%) in 2020. Most of this increase occurred in countries within the WHO African Region. In spite of the increase in incidence, there was a global decrease in mortality rate by 2% between 2020 and 2021. The COVID-19 pandemic caused service disruptions that resulted in an estimated 63,000 deaths between 2019 and 2021 (1).

Malaria is the leading cause of under-five mortality in Africa, accounting for over two-third of malaria death in Sub-Saharan Africa (2), and contributing to about 10% of the continent's overall disease burden. It accounts for 40% of public health expenditure, 30-50% of in-patients admissions and up to 50% of outpatients visits in areas with high malaria transmission (3). In Africa, most cases of malaria are diagnosed on the basis of clinical symptoms and treatment is presumptive rather than based on laboratory confirmation.

About 90% of all malaria deaths in the world today occur in Africa, South of the Sahara. This is because the majority of the infections in Africa are caused by *P. falciparum*, the most dangerous of the four human malaria parasites. Additionally, the effective malaria vector, the mosquito *Anopheles gambiae*, is widespread in Africa. Controlling this mosquito species is significantly challenging especially in areas with low socio-economic stability and poor healthcare facilities (3,4).

Malaria is the most widespread endemic disease in Cameroon, annually responsible for greater than two million reported cases, and resulting in increased absenteeism from school and workplaces. The peak transmission period of malaria is between July and October (5). Cameroon is among the **fifteenth** High Burden High Impact countries bearing 70% of the global burden of malaria as reported by the World Health Organization (WHO) (1).

Again, at the national level, malaria is responsible for 50% of hospitalizations in health facilities with 65% of cases affecting children under 5 years of age. The incidence of malaria mortality remains highest in the North and Far North regions. Overall, Cameroon ranks among the 15 highest burden malaria countries, representing 2.7% of all global malaria cases and deaths, and 2.3% of malaria deaths in 2021(1,6). This makes it the third highest contributor of malaria cases in Central Africa, accounting for 12% of all cases in 2021(1).

Suspected malaria cases caused 30% of all medical consultations, and 21% of visits to health facilities resulted in a diagnosis of laboratory confirmed malaria. According to national statistics from 2015, health facilities attributed 19% of deaths to malaria, and suspicion of severe malaria accounted for 48% of all hospital admissions(1). Between 2020 and 2021, there was a 1.6% decrease in case numbers, decreasing from 249 to 245 per 1000 of the population at risk. During the same period, mortality rates also fell by 7%, from 0.55 to 0.51 per 1000 of the population at risk. Less than 30% of children who reported having fever were tested for malaria most likely due to the fact that they must have taken some antimalarial at home and so treatment commenced at once (1). This disease causes symptoms such as fever, chills and flu-like illnesses, and in severe cases, life-threatening complications especially among vulnerable populations such as pregnant women and children(7).

The focus on this specific area is of significant interest due to the profound impact it has on the health and well-being of the residents. Moreover, this study aims to find out the prevalence of malaria and its associated outcome being either admission or not, this will help assess the effectiveness of interventions and guide future healthcare strategies as complications from malaria can lead to hospitalization and increased health costs, which would affect productivity and place a considerable strain on the healthcare system and community in general.

### **Tombel Health District Demographic in Cameroon.**

Tombel is located in the Southwest Region of Cameroon within the northern part of the Mungo Valley(8), and is the largest town in the Kupe-Muanenguba Division. Traditionally associated with the Bakossi people, Tombel now boasts a diverse population, with large numbers of individuals hailing from various tribes and regions across Cameroon. The residents of

Tombel primarily engage in agriculture as their main source of income, relying on the cultivation of crops such as cocoa, plantains, and cocoyam, which serve as their primary cash crops. The Tombel health district, one of the 189 health districts in Cameroon, is divided into seven health areas namely: Baseng, Ebonji, Nyasoso, Edibenjock, Ndom, Tombel, and Ndibenjock. The health district has a total population of 63,267 (8). The town of Tombe experiences a warm and humid climate characterized by two main seasons: a long rainy season spanning 8-9 months, and a dry season lasting 3-4 months) seasons, resulting in flourishing vegetation (8). Abundant rainfall and vegetation creates favourable conditions for numerous mosquito larvae to develop, and provides numerous adult resting sites.

Houses in Tombel mostly consist of plank structures with no ceiling and screens on doors or windows, exposing residents to intense mosquito bites (9). Although there are several hospitals in the Tombel health district, including Tombel District Hospital, which is managed by the Ministry of Public Health, there is however an urgent need to renovate the infrastructure and enhance the quality of care delivered. The shortage of hospital equipment, like beds, mattresses, and mosquito nets, adds to the challenges patients face during their admission. Furthermore, the deteriorating drainage infrastructure and insufficient maintenance contribute to a thriving mosquito environment, potentially leading to reinfections and nosocomial infections.

## **METHODOLOGY:**

This was a hospital-based retrospective study that utilized hospital-based data collected from July 2022 to July 2023 extracted from the hospital register for all patients received at the Tombel Health District Hospital. The data collected included parameters such as: serial number, age, presumptive diagnosis, laboratory investigations, definitive diagnosis and treatment status (outpatient or admitted).

Diagnosis of malaria was made based on either the rapid diagnostic test kits or malaria parasite microscopy using standard operating procedures.

All participants visiting the Outpatient Department (OPD) and diagnosed with a disease were recorded. Individuals who left before the definitive diagnosis was made, that is, those who did not undergo laboratory test procedures or receive diagnostic results, were excluded from this study.

## **RESULT**

### **DESCRIPTIVE STATISTICS**

Secondary data collected from the health center was input and cleaned in Microsoft Excel for Windows version 2016 (Microsoft Corporation, Redmond, Washington, USA); subsequently, the cleaned data was exported to IBM SPSS version 26.0 for Windows (IBM Corporation, Armonk, New York, USA). Descriptive variables included age, sex, period, years and marital status were analyzed through univariate analysis to determine the prevalence of hospital based malaria.

### **SOCIO DEMOGRAPHIC DATA**

This study comprised data collected from 1177 hospital files each representing an individual participant. The majority of files reviewed were from the year 2022 (618, 52.4%), with data specifically collected for the month of July to December. Among these, October 2022 had the highest representation (276, 23.4%). The majority of the participants were single (598, 50.8%). The participant's ages ranged from 1 to 1200 months and most cases involved females (722, 61.3%). Table 1 below summarizes the socio demographic characteristics of the 1,177 participants;

Table 1: Socio-demographic data

<b>CHARACTERISTICS</b>	<b>LEVEL</b>	<b>FREQUENCY</b>	<b>PERCENTAGE (%)</b>
<b>Sex</b>	Female	722	61.3
	Male	455	38.7
<b>Year</b>	2022	618	52.5
	2023	559	47.5
<b>Marital Status</b>	Single	598	50.8
	Married	541	46
	Child(0-5)	18	1.5
	Widow	15	1.3
	Divorced	5	0.4
<b>Period</b>	October	276	23.4
	July	169	14.4
	January	107	9.1
	February	100	8.5
	June	90	7.6
	August	89	7.6
	March	86	7.3
	November	83	7.1
	May	64	5.4
	September	63	5.4
	December	50	4.2
	<b>Age Range</b>	Child	305
Adult		872	74.1

### **PREVALENCE OF HOSPITAL BASED MALARIA**

Malaria was diagnosed in 329 of the 1177 hospital files reviewed, resulting in a prevalence of 28.0%. This prevalence includes cases of solely malaria as well as instances where malaria was diagnosed alongside other conditions. Table 2 below presents a detailed breakdown of the malaria diagnoses, including information on co-diagnosed conditions. Table 2 below represents the statistic;

Table 2: Prevalence of hospital based malaria and co-diagnosed conditions

<b>Confirmatory Diagnosis</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Malaria</b>	329	28

<b>Others</b>	848	72
<b>Total</b>	<b>1177</b>	<b>100</b>

### MALARIA OUTCOME

A total of 155 (47.1% of the total malaria diagnoses) resulted in admission, while 174 cases (52.9%) were discharged. This indicates that a majority of malaria cases led to discharge with little or no complications. Table 3 below presents a detailed breakdown of the outcome of malaria cases, distinguishing between admissions and discharges.

Table 3: Malaria outcome

STATUS	CONFIRMATORY DIAGNOSIS		Total
	Malaria	Others	
<b>Admitted</b>	155 (47.1%)	262 (30.9%)	417
<b>Discharged</b>	174 (52.9%)	586 (69.1%)	760
<b>Total</b>	329	848	1177

Confirmatory diagnosis and Age range were found to be significantly associated with the status of being admitted in the hospital. With malaria, an adult is 1.883 more likely to be admitted, and a child (Pediatric) is 1.445 times more likely to be admitted compared to an adult.

Table 4 :CONFIRMATORY DIAGNOSIS OF MALARIA

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test Wald Chi-Square	df	Sig	Exp(B)
			Lower	Upper				
(Intercept)	-0.888	0.0814	-1.047	-0.728	118.945	1	0.000	0.412
[CONFIRMATORY DIAGNOSIS=Malaria]	0.633	0.1351	0.368	0.897	21.922	1	0.000	1.883
[CONFIRMATORY	0a	.	.	.	.	.	.	1

<b>DIAGNOSIS=Other ]</b>								
<b>[AgeRange=Pediatric]</b>	0.368	0.1393	0.095	0.641	6.979	1	0.008	1.445
<b>[AgeRange= Adult]</b>	0a	.	.	.	.	.	.	1

## AGE RANGE

Of the total cases of malaria, most of them were adults 205 (62.3%) with the pediatric age group being the rest 124 (37.7%).

Table 5: Age wise distribution of diagnosis

Group	CONFIRMATORY DIAGNOSIS		Total
	Malaria	Other	
<b>Pediatric</b>	124 (37.7%)	181 (21.3%)	305
<b>Adult</b>	205 (62.3%)	667 (78.7%)	872
<b>Total</b>	329 (100.0%)	848 (100.0%)	1177

Also, of the total 307 pediatric cases, 124 (40.7%) had malaria and a majority 181 (59.3%) were diagnosed to have other problems. Also, most of the adults 667 (76.5%) were diagnosed with issues not concerning malaria.

There was a significant difference between the diagnosis and age group, with a greater percentage of children diagnosed of malaria as compared to adults.

Table 6 :Group distribution of confirmatory diagnosis

Group	CONFIRMATORY DIAGNOSIS			P-Value
	Malaria	Other	Total	
<b>Pediatric</b>	124 (40.7%)	181 (59.3%)	305 (100.0%)	0.000
<b>Adult</b>	205 (23.5%)	667 (76.5%)	872 (100.0%)	

## DISCUSSION:

This hospital based cross sectional study, had in total 1177 case files, where in 455 were males and 722 were females, this difference could be due to the fact that, most males preferred coming to the hospital only in severe critical cases, as such stayed home to received traditional medicine or over-the-counter medications in order to reduce expenses and cost(10). Again, we noticed that there was a prevalence of 28% of confirmed malaria observed in the Tombelhealth district alone which is increased according to the study carried out by Nkondjio *et al.* 2017, where they recorded that the prevalence of malaria in Cameroon was 24%(6), due to the fact that the Southwest region is a malaria hotspot area(95% confidence level) (11).

This is a call for concern as this is an endemic area and most of the inhabitants use their long lasting treated mosquitoes net rather for gardening in an attempt to prevent animals from eating their crops and as such, accounts for the increase prevalence of malaria within this area as the use of Long lasting treated mosquitoes nets has been found to reduce malaria incidence in sub-saharan by 50%(12). The Buea University Medical Students, were hard on this point during the 1 week health campaign held within the Tombelhealth district as we re-iterated the importance of using this nets at home to prevent this diseases and told the population, the consequences of their action. We provided alternative to the farmers like the use of wood ache and less costly insecticide to drive off pest and stray animals.

There was an increase in malaria prevalence observed in adults (greater than 15 years) of 62.3% while the prevalence of malaria in pediatric cases was found to be 37.7% and linked to increase in the mortality rate for children under 5 due to difficulties in case management, in particular delayed access to care and prolonged stock-outs of drugs (injectable artesunate) during the season of high transmission(5), most often observed within this locality due to poor roads, infrastructures and personnels and if we want to reach our target of reduced infant mortality rate by 2030 in achieving Sustainable Development Goal 3, we need to make precise public health action via education, eradication of poverty(13). Furthermore, the month of October accounted for most cases diagnose at the hospital, which equally is in line with the Severe Malaria Observatory, where in highest period of transmission of malaria is observed within the period

from July to October, typically, the helm of planting and harvesting is observed during this period as such accounting for the increase incidence of patients turnover, however this was different from the study carried out by Chiabiet *al.* 2020 in Yaounde(14), Cameroon, due to the different in Season as Yaounde has four main climate (2 raining season and 2 dry season) whereas the Tombel district area has two seasons (1 raining and 1 dry season).

The outcome of malaria observed at the Tombelhealth district, saw that 52.9% of patients diagnoses with malaria, had to be discharged which is different from the study published by the Severe Malaria Observatory, where malaria accounted for 60% of hospitalization cases in Cameroon(5), this difference could be due to lack of income for parents to pay for hospitalization and proper hospital care, as such tend to take these patients or themselves, back home even in critical state.

## **CONCLUSION:**

Malaria is still a major public health concern in Cameroon, specifically in the Tombel Health District area where it has many risk factors for increase in malaria prevalence like: economic status, poor road, low health personnels, swampy areas, nature of jobs(most being farmers) and which negatively impact the outcome of malaria in this area in terms of hospitalization, affecting their economic status and standard of living.

We therefore call for public action to be done by supporting the inhabitant especially via education and sensitization as it will then positively affect their attitude towards the use of insecticide treated mosquitoes nets and ill in turn reduce the burden of malaria and positively affect the outcome. Future research could better enhance the usability of government and non-governmental insentives for the eradication of malaria in this health district area.

Consent:

Administrative approval and consent for the use of the hospital data was given by the District Director of the Tombel Health District (Dr Augustine EffiomElongeFobia).

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

Option 2:

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology

Details of the AI usage are given below:

- 1.
- 2.
- 3.

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