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Original Research Article

Malaria Prevalence among Children 0 To 5 Years in Kumba Baptist Health Centre in 2021

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Abstract

This survey on the prevalence of malaria was carried out in Kumba involving children from 0-5 years (220 children) from 1th Dec. 2021 to 31th Dec 2021 involving some 1043 households. In Kumba malaria is one of the leading causes of morbidity and mortality, especially in children under 5 years. The overall goal of this study is to sensitize the government, health authorities and the local population about the malaria reality. The results reveal that, out of the 220 children, 159(72.3%) had malaria with the mean (±SD) of platelet counts for the 159 children in the malaria positive group (172.2(±113.8) x103/µl; p<0.00) was significantly lower than that in non-malaria infected group (322.2(±123.9) x103/µl; p< 0.001).

1.1 Background

The fight against malaria has for a long time been the objective of the Kumba health district. This region is one of the hardest hit malaria zones of Cameroon with Children under five years in various communities being the most affected group.

Kumba Baptist Health Centre has as objective Seventy-five percent (75%) of its activities on preventive measures while twenty-five percent (25%) are curative. In this regard therefore the health centre's malaria control program had as goal to reduce malaria-related mortality by ≥50% through a rapid scale-up of four effective malaria prevention and treatment measures: these are, insecticide-treated mosquito nets (ITNs); indoor residual spraying (IRS); accurate diagnosis and prompt treatment with artemisinin-based combination therapies (ACTs); and intermittent preventive treatment of pregnant women (IPTp) (Kumba Baptist health centre, 2019).

The general objectives of the above MSP (Malaria Strategic Plan) are:

First of all to reduce malaria mortality from 2021 levels by 50% by 2023;

Furthermore, to reduce malaria incidence from 2021 levels by 50% by 2023; and Lastly, to reduce malaria transmission to a very low level.

To be able to achieve the above objectives the health centre supports the community during their routine outreach programs with case management with RDTs, anti-malarials for treatment at health facilities and in the community, procurement of LLINs, the strengthening of monitoring and evaluation systems, and resources for health communication, health systems strengthening (HSS), health management information systems (HMIS), and program management operating costs.

1.2 Methodology

The methodology involved the collection of Blood samples from some children from 1month to 60 months old with signs and symptoms of malaria into EDTA tubes and used to prepare thin and thick blood films which were then used for Giemsa microscopy to detect malaria parasites and parasite density.

Study design

The study design was potential patients based descriptive quantitative cross-sectional survey. The study was conducted in the Kumba Baptist health centre. It involved a day by day cross-sectional survey and Compellation analysis of malaria prevalence with data from health centre statistics office.

1.2.1 Study population

The study population consisted of 220 children aged 0 to 5 years, of both sexes. Visits were equally made to some surrounding quarters notably Fiango and Meta quarters to explain the objectives and potential benefits of the study (free malaria test) to the parents.

1.2.2 Data ***Collection***

Prior to the collection of blood samples, data such as age, sex and auxiliary temperature were recorded in a structured checklist. Capillary blood from a finger prick was used for the preparation of thin and thick blood films. A heparinized capillary tube was filled with blood for the determination of packed cell volume (PCV). Some details on how specimen was collected and analyzed before this need assessment can be see below.

1.2.3 Data analysis

The data collected was entered into Microsoft excel (2007) software program and double checked for errors before being exported to IBM statistical package for social sciences (SPSS) version 2.1 for analyses. Patients were categorized based on microscopy results into parasitaemic (malaria smear positive) and non-parasitaemic (malaria smear negative) groups.

1.2.3 Data analysis

The data collected was entered into Microsoft excel (2007) software program and double checked for errors before being exported to IBM statistical package for social sciences (SPSS) version 2.1 for analyses. Patients were categorized based on microscopy results into parasitaemic (malaria smear positive) and non-parasitaemic (malaria smear negative) groups.

Thick and thin blood films were stained with 10% Giemsa for 20 minutes, after fixing thin films with absolute methanol for one minute. The thick and thin films were observed using the 100X (oil immersion) objective of the microscope (Optical Co. Ltd, Japan), for the detection of parasites and species, respectively. A blood smear was declared negative only after examining 100 high power fields, without seeing any parasites. Only specimens that had P. falciparum alone were considered in this study. Asexual parasite density and gametocytaemia were determined by counting parasites against 200 WBC and 500 WBC, respectively assuming a white cell count of 8000 leucocytes/ µl of blood, and expressed as parasites per µl. Slides were read separately and independently by two experienced microscopists in the health centre and in the case of any discrepancies, slides were read again. Children positive for malaria were treated with a combination of malartin (artesunate) and amodiaquine.

1.4 Study and Results Obtianed

. A cross-sectional study involving 220 children from 1month to 5 years old with signs and symptoms of malaria has ever been conducted at the health centre as seen above. According to health centre statistics Blood samples were collected from children into EDTA tubes and used to prepare thin and thick blood films which were then used for Giemsa microscopy to detect malaria parasites and parasite density which led to the results seen below.

1.4.1. Illustrations of results

The 2021 study involved male and female Cameroonian children of age one month to 60 months presenting with signs and symptoms suspicious of malaria which after consultation with the physicians were referred to the laboratory for investigations. After the malaria parasite test, the patients were categorized into two main groups; those who tested Positive for malaria and those who tested negative. The informed consent of the accompanying parents or guardians was obtained for each child included in the study by giving them a consent form and explaining in details the objectives, benefits and procedure of the study. The age, sex, axial body temperature and medical history of each child, alongside information on occupation/profession of parent/guardian and quarter of residence were obtained from the accompanying parents or guardians through the administration of a basic structured questionnaire.

1.4.3 Microscopic examination and quantification of parasites

Each blood film was independently examined microscopically by two well trained and experienced microscopists using the 100x objective and the 10x eye piece and the parasite number counted. The number of parasites per microliter (ul) of blood was determined by systematically counting 200 white blood cells while counting the number of parasites in each field covered in the thick. Slides were considered positive when schizonts, trophozoites and/or gametocytes of *Plasmodium* were observed on the blood film. Thin films were observed to determine the *Plasmodium* species and any abnormalities in blood cell morphology.

1.4.4 Performing Full Blood Count (FBC)

The EDTA test tubes containing the blood samples were gently inverted about 8 times to ensure complete mixture of blood cells and a complete haematological analysis of each blood sample was performed following the manufacturer's instructions using the URIT-3000 Haematology analyzer and the values of white blood cells (WBC), Red blood cells (RBC), platelets, Haemoglobin, Haematocrit (Hct), Mean Corpuscular Volume (MCV), Mean cell Haemoglobin (MCH), Mean Cell Haemoglobin Concentration

(MCHC), Granulocyte %, Lymphocyte %, Granulocyte number and Lymphocyte number were determined.

In this regard the endpoints were defined as follows

- Parasitaemia was categorized as low (<1000parasites/µl blood), moderate (1000-4999parasites/µl blood) and high (≥5000 parasites/µl blood);
- A haemoglobin level of <11g/dl was considered to be anaemic;
- Microcytosis was defined as MCV of less than 73fl
- Leucopaenia was defined as WBC < 4.5 x 103/µl;
- Leucocytosis was defined as a total white cell count >17000/µl

- *Thrombocytopaenia was defined as platelet count <150000/µl and severe thrombocytopaenia as platelet counts < 50000/µl.*

The data collected in questionnaire was entered into Microsoft excel (2007) software program and double checked for errors before being exported to IBM statistical package for social sciences (SPSS) version 21 for analyses. Patients were categorized based on microscopy results into parasitaemic (malaria smear positive) and non-parasitaemic (malaria smear negative) groups. Data for the different haematological parameters were expressed as mean (+SD) and percentages were used in the evaluation of descriptive statistics. Multivariate linear regression models were used to assess for any sex differences in the haematological parameters in either parasitaemic or nonparasitaemic groups.

Table 1: ***Baseline characteristics of the 2021 study population***

	Number of Participants 220		
	Males %	**Males %**	

	144 (65.5)	76(34.5)	
	Mean age in years 3.375		
Mean temperature in °C ± SD 37.90C (±0.8)			

60 months (5years) old in the health centre Njangane who were suspected by the consultant to be suffering from malaria. The mean age of participants was 3.375 years whereas the male (144) to female (76) ratio was approximately 2 to 1 (2:1) as shown below.

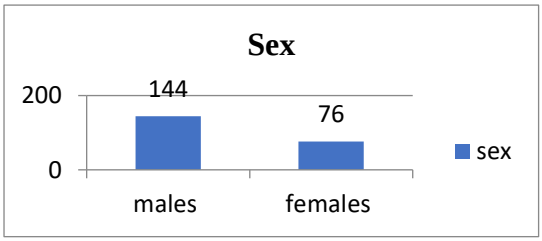

Figure 1 less than 5years participation in the study

As figure two below shows, 158 (71.8%) of the children were under 2 years old, 53 (24.1%) in two to three years of age and nine were between 4 and 5 years

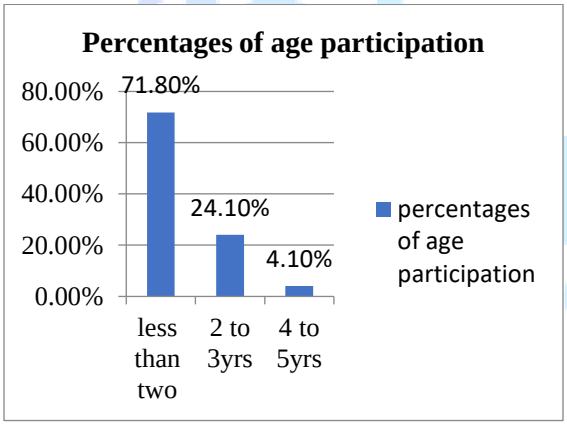

Figure two: percentages of less than 5yrs who participated in the study

The mean (±SD) axial temperature of participants was 37.9^{0}C (±0.8) whereby the mean temperature of the malaria-infected children was 38.1^{0}C and non-malaria infected was 37.3^{0}C (Table 1 above).

1.5.2 Prevalence of malaria in the study area

Revealed below by figure three, Of the 220 participants, 159(72.3%) had *Plasmodium falciparum* malaria while 61 (27.7%) were tested negative as confirmed by microscopy in the Kumba Baptist health centre.

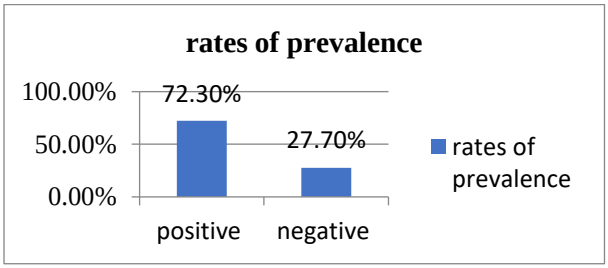

Figure three: rates of prevalence of *Plasmodium falciparum*

Coming back to figure one above, The difference in the prevalence of malaria between the male and female participants was not statistically significant (χ^2 = 0.086, *P* = 0.769) but was statistically significant when the number of *positive* cases in various age groups and the quarters involved in the health centre's catchment area were compared with *others*. With respect to the parasite density per age groups, 71(44.7%) of the age group 1 to 2 yrs had a parasitaemia <1000 parasites/µl (low), 3 to 4yrs, 48(30.2%) had a parasitaemia between 1000-4999 parasites/µl and 40(25.2%) of the age group 4 to 5yrs had a parasitaemia of > 5000 parasites/µl (high)

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Figure three: rates of prevalence of *Plasmodium falciparum*

Table 2. Prevalence of malaria according to sex and age groups.

Ages (<5years)			+ve cases	-tive cases
Sex	Males	144	105(72.9%)	39(7.1%)
	Females	76	54 (71.1%)	22(8.9%)
	Total	**220**	**159(72.3)**	**61(27.7%)**

Based on the above Out of the total under-fives who were tested 220, (45%) were from pulleting A and B (Meta Quarters) and (50%) of these tested positive were from pulleting B and C (Fiango and Environs). The rest 5% were from other quarters in kumba like Lido Streets, Kumba Town, Buea Road and Mambanda

1.5.3 Factors associated with the prevalence of malaria among under-fives in *Kumba Baptist health centre*

Malaria was found to be associated with variety of factors. From the analysis the education status of the parents/guardians was statistically significant. The likelihood of getting malaria was found to increase 9.95 times more as compared to those who were educated. the association between the education status and the prevalence of malaria was found to be significant. It was further observed that the chances for the under-fives to get malaria was 1.24 times to those who were self-employed than those who were the employee of the public service. And the likelihood of getting malaria among the under- fives whom their parents were farmers was 1.31 times higher as compared to public service workers. Health seeking behavior was found to be associated with the prevalence of malaria among the under-fives hence the association between children who were having episodes of fever within the past six month and yet were not taken to the health facility presented a higher prevalence of malaria. the likelihood of getting malaria among children who were not being taken to the hospital was 1.34 time higher than those who were taken to the hospital).

Malaria was further associated with Physical /housing environmental factors. It was observed that the association between the prevalence of malaria and the houses which were situated proximal to the farming activities was statistically significant. Houses with windows that were not screened with mosquito wire mesh; the likelihood of getting malaria was times higher than the screened ones.

Furthermore presence of separate room in the house was also being observed as one of the associated factors with the prevalence of malaria whereby it was observed that the likelihood of getting malaria in those houses without separate rooms was higher than the houses which were having separate rooms.

In houses with rooms that had no space for hanging nets, the likelihood of getting malaria was higher than the houses of which their rooms had a space for hanging the nets. In addition, the association between the prevalence of malaria and the use of ITNs/LLITNs was significant. And the likelihood of getting malaria among the families whom their houses were not sprayed with IRS was 3.011 times higher than the houses sprayed with IRS.

1.5.5 Seasonality and the use of ITNs

Rainfall plays a crucial role in malaria transmission hence it is being regarded as one of the factor that are associated with

the prevalence of malaria in the study area. This is because rainfall provides breeding sites for the aquatic stages of the mosquito's life cycle. In this study as shown by figure 14 it was observed that (59%) families frequently mentioned that ITNs were used throughout, 106 (27 %) mentioned that they were using the LINs during the rainy season, (13%) mentioned that they were not sure of the season and (1%) mentioned that they were using the ITNs during the dry season.

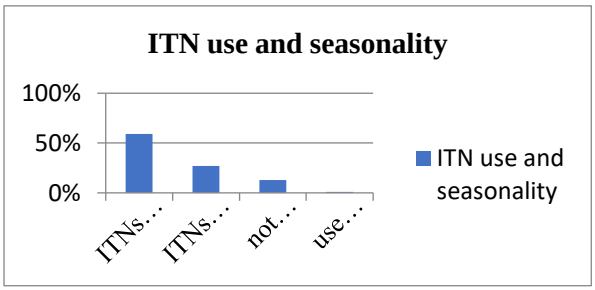

Figure 6: ITN use and seasonality

1.5.6 The coverage /ownership/ use of ITNs in the population

ITNs ownership was observed among the participants whereby only 31(7.9) participants did not own the mosquito nets and out of these 23(74%) were from Fiango and environs and 8 (25%) were from Meta quarters and environs

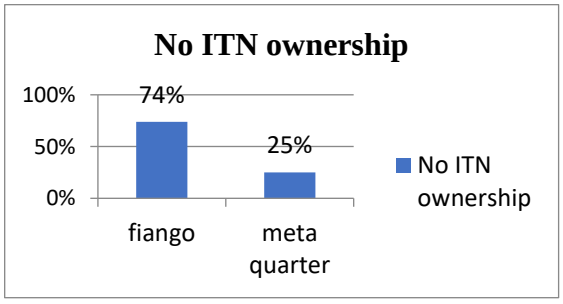

Figure 7: number of people without LLINs

Out of the interviewed participants (30.2%) said that their households owned at least one mosquito net, 240(61.4%) said their household owned two mosquito nets and 33(8.4%) of them owned more than three mosquito nets.

The reason for not owning the LINs were mentioned: whereby 14(8.4%) mentioned that their nets were old since the last 2015 mass distribution campaign and that they couldn't afford buying the mosquito nets, 10(6%) mentioned that they

were lost since they got chased from their houses as a result of the ongoing socio political crisis in the two English regions of Cameroon 7(4.2%) said that they were being used for other purpose. It was further being observed that 116 (30%) acquired them for free from the government. while 200(51%) of the population acquired them thorough the routine visits to the hospital and the rest 75(19%) bought their nets from the nearby shops. Out of the screened children, 311(79.5%) slept under a mosquito net during the previous night and only 80 did not. Mosquito net coverage was observed to be 68% in meta quarters and environs and 89% in Fiango and environs. The overall coverage of the total net use in both was 79.5%.

The reasons for not using the ITNs were also being analyzed as shown below

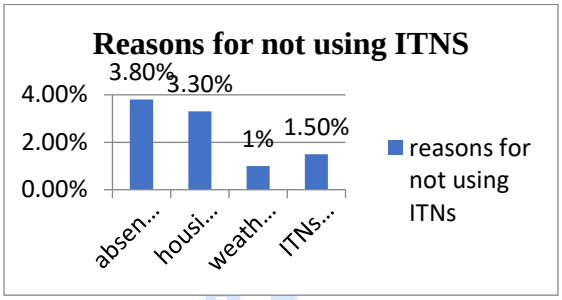

Figure 8: reasons for not using LLINs

1.6 Discussion and Identified Issues

This needs assessment was carried out in kumba precisely in the Njangane health centre with the primary objective to determine the prevalence, of malaria among the under-fives and the associated factors. The overall prevalence of malaria in 2021 study population was 72.3% which was lower than the value reported by Ndip et al., 2015 in Kumba and Njunda et al., 2015 in Muyuka. The decrease in the prevalence of malaria may be due to adherence to measures recently implemented by the Cameroon government through the Ministry of Public Health. These include the free distribution of long-lasting insecticidal nets and continuous public education on their use in the prevention and control of malaria. A similar decline of malaria burden in children as a result of the above mentioned interventions has been reported in countries such as Tanzania and Kenya.

Furthermore, the present 2019 study of this health centre, reports a significant decrease in hemoglobin level in children in the malaria-infected group as compared to those in non-malaria infected group resulting in overall prevalence of being 72.3%. This was comparable to the results obtained by Maina *et al*., 2010. This finding is in agreement to study of Kimbi *et al*, 2013, but contrary to results of Maina *et al.,* 2010.

Several factors were observed to be associated with the high prevalence, these includes: socioeconomic factors, physical/environmental factors of which favors the mosquito breeding sites as well as ineffective implementation of malaria control measures such as the use of ITNs and IRS. For example, It was revealed and supported by a study that was done in Kenya, (Bloland *et al* 1999) that the majority of

caretakers in the study had <8 years education, which was predictive factor of parasitaemia. This concurred with the analysis of an education status where it was revealed that the parents/guardians education status was significantly associated with increased risk of the under-fives getting malaria.

Employment status of the respondents was also being observed to be one among the possible factor that were associated with the prevalence of malaria among the under-fives during the survey. This concurred with (Makundi, *et al* (2007) who reported that the burden of malaria is greatest among poor people, imposing significant direct and indirect costs on individuals and households and pushing households into in a vicious circle of disease and poverty. This was also being observed in a study done by Wandiga, et al. (2006.) who stated that, vulnerable households with little coping and adaptive capacities are particularly affected by malaria hence they can be forced to sell their food crops in order to cover the cost of treatment

Furthermore, according to this need assessment findings housing and environmental factors such as the proximity of the house to the breeding sites/ and farming activities were found to be associated with the prevalence of malaria. This was also being revealed in a study done by, (Lindsay, *et al* 1993) whereby it was reported that the relationship between malaria vector density and the distance of settlement from a water body like river is an important indicator of malaria transmission. It was also being supported by (Shell, 1997), who reported that certain types of housing may influence malaria transmission. Greater exposure to the outdoors (lack of windows or screens, for example), may increase contact between an individual and the mosquito vector.

According to the findings of the study, the concept of using of ITNs was considered as one of the protective factor against the mosquito bite; hence reduce the prevalence of malaria among the under-fives. This was supported by the MoHSW (2006) report, which stated that Insecticide-treated mosquito nets (ITNs) used for protection against mosquito bites have proven to be a practical, highly effective, and cost-effective intervention against malaria.

Despite the fact that the use of ITNs was considered as one of the protective method, It was further being identified that the prevalence of malaria among those who were not using the ITNs was observed high as compared to those who were using: in Fiango area the 70% of the surveyed households were not using the Insecticide treated Nets Selective indoor residual spraying (IRS) remains one of the key strategies of the NMCP, though primarily used for epidemic prevention and response. Indoor residual spraying with insecticide has been shown to be highly effective as a malaria control measure in reducing the incidence of malaria infections and deaths in a number of settings (Oaks *et al* 1991).

However, the study findings supported that IRS, was associated with protection from parasitemia in both bivariate and multivariate analysis, it was also being observed that many of the residents who were residing in Fiango area were migrants who were coming many other areas as a result of the ongoing Anglophone crisis in Cameroon. Due to the issue of settlement then people were found staying in places which were very prone to malaria hence this

increased the chance of mosquito bites and thus the high prevalence. Taken together, the results presented here illustrate that: ITNs use, IRS, parents/guardians education status, economic status; physical/environmental factors are the predictive factors of the prevalence of malaria among the under-fives.

1.7 Conclusion

This needs assessment has revealed a high prevalence of malaria in the study area. The higher prevalence could be the result of several factors as explained in this study. The finding reflects that if the control measures will be implemented appropriately then the prevalence of malaria will decrease. Carefully coordinated surveillance and response are required to address ongoing level transmission hot spots.

1.8 Recommendations

- There is the need for a strong collaboration among major stakeholders including the Government, local councils and Non-Governmental Organizations to sensitize the communities on Malaria as a disease as well as developing an effective method for prevention and control of the disease.
- Though the use of LLINs and clean environments are identified as the major methods of prevention for many households, the implementation of these methods is still questionable. Therefore, the implementation of these methods needs to be re-assessed by concerned authorities in order not to endanger the health of the people.
- Efforts must be made by the major players in the health sector to make mosquito nets readily available in the communities affected by the current Anglophone crisis.
- Education on the use of LLINs in households should be sustained. Those who have nets should be encouraged to use them.

In order to improve timeliness of treatment, the service consequently needs to be closer to the communities especially those found in the remote and malaria endemic areas.

Acknowledgement

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