

PREVALENCE OF MALARIA PARASITAEMIA AND ASSOCIATED RISK FACTORS AMONG FEBRILE CHILDREN ATTENDING A SECONDARY HEALTH CARE FACILITY.

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ABSTRACT

Background: Malaria remains a serious public health concern worldwide, particularly in tropical and subtropical regions, and the leading causes of mortality and morbidity in children especially among those aged under five in developing countries. Malaria can be fatal if not promptly and accurately diagnosed, especially in children. This study was carried out to determine the level of malaria infection and its associated risk factors among febrile children. **Methods:** Blood samples were collected and analyzed from two-hundred (200) systematically selected febrile children aged 1-10 years old. Assays of samples collected were carried out using standard methods. Data were collected using a pre-tested structured questionnaire. **Results:** Results obtained from study subjects shows that, of the eighty-seven (87) infected subjects, 34 (39.1%) were aged 1-5 years, while 52 (59.8%) were within the range of 6 years and above. Severity of infection showed 48 (55.2%) with scanty parasitic infection while 25 (28.7%) showed moderate infection, and 13 (14.9%) showed heavy infection. The association of age and level of parasitemia showed that 34 (58.8%) subjects below 5 years, recorded scanty malaria compared to 14.7% with severe malaria within the age range. Considering gender, of the 33 infected female subjects, 45.5% had scanty malaria, 36.4% showed moderate malaria, while 18.2% had severe malaria, compared to the male subjects. **Conclusion:** This study reveals the prevalence of malaria infection with some level of severity among children at our study location. The need for prompt diagnosis and improved access to all malaria interventions becomes relevant, with a special focus on the high risk group.

Keywords: Malaria parasitaemia, Risk factors; Malaria Diagnosis; infectious mode in children

Introduction

Malaria continues to remain a global burden and a threat to world health despite increasing awareness and public health efforts aimed at improving vector control, therapeutics and diagnostics, which in recent times have reduced the incidence of the infection worldwide, [1]. Regardless of the fact that malaria is curable, it still accounts for the death of many patients annually. Children under 5 years old are the group most vulnerable to malaria infection because of less developed immune system. [2]. Fever is the most widespread presentation of malaria. Malaria is considered a major differential diagnosis in patients presenting acute febrile illness, particularly those with organomegaly, and changes in liver function tests. [3]. The impact of malaria most often extends beyond health facilities and healthcare provisions to homes and everyday lives. Children may

likely develop some long-term complications such as neurological sequelae following severe malaria attacks, further developments like cognitive impairments as a result of both severe and uncomplicated episodes abounds[4]. The burden of malaria in communities particularly low income and underdeveloped countries reflect intrinsic and extrinsic determinants. Host immunity, an intrinsic factor, is age dependent in a malaria stable country like Nigeria. In such areas, the under-five age group are the most vulnerable to malaria infection, Clinical malaria in them has been shown to be associated with very low parasite densities [5].Nigeria seem to have a higher number of cases of malaria infection and subsequent records of deaths compared to other countries of the world. This also accounts for a mortality rate of about 30% among children under the five years of age with a record of about 25% infant mortality,[6]. Furthermore, studies have shown from literature that the level of illiteracy among the caregivers to these children, cases of poverty and a high level of ignorance among parents unfortunately tends to place children at higher risk of Malaria infection, [7]. However, findings had shown that while malaria infection remains the most common cause of death among children under five years of age, pregnant women are also prone to infection by the malaria parasites in developing countries,[8]. To reduce the rate of transmission, it has been found that indoor residual spraying (IRS), appropriate and prompt diagnosis of infected subjects coupled with timely treatment with effective antimalarial drugs is of high necessity. Similarly, in most developing countries and communities prone to malaria infection, the distribution of Malaria insecticide-treated nets and adequate vector control measures in such localities are pivotal to the success of the fight against the malaria parasite, thereby contributing to about 68% and 78% of the progress recorded respectively at vector eradication,[9].Studies have similarly shown that inadequate enlightenment of the populace particularly in rural areas, lack of basic hygienic environments, dearth of essential amenities, low immunity of children from malnutrition has been realized to expose and place children at an unfortunate higher risk of Malaria infection.

Methodology:

Materials and Methods:

Study area: The study was conducted at the Landmark University Medical Center Omuaran, a city located in North Central Nigeria, with an Average relative humidity (at 15:00 LST). The city is located at the IrepodunLGA, in Kwara south Senatorial zone.

The Landmark University Medical Laboratory was used for sample collection and assay.

Study population: The study population comprised of febrile children recruited consecutively using purposive sampling method. Obtained parental consent qualifies a child with febrile conditions, to be enrolled for the study, thereby fulfilling the inclusion criteria. However, persons who refused consent to the study and showed non-febrile evidence were excluded.

The age range of children enrolled for the study and those serving as control group were between the age of 1 and 10 years, cutting across both genders. A Well-structured questionnaire was used to collect demographic data and other pertinent information.

Population Size:

A total of Two-Hundred (200) Febrile subjects were recruited for the study while one-hundred (100) samples were taken from healthy subjects as control.

Ethical permit and consent to participate: The ethical committee of the Landmark University Medical Center provided provisional approval for the protocol of this study. (LMC/2020/02B/32). Consents to participate in the study was obtained from parents and caregivers of subjects that were recruited for the study, this was done prior to sample collection.

Sample collection and processing: Blood samples from subjects were collected from finger prick aseptically using sterile blood lancet to prepare thick and thin blood film

smears.obtained samples were then stained with supravital dyes (Giemsa stain). Stained samples slides were assayed and processed within 24 hours of collection.The films were observed according to the method described in, [10]. Malaria parasite infection was screened using rapid test kit (Bio line) according to the method of [11] and confirmed microscopically based on the method adopted in the study conducted by Parsel *et al*[12].

Data Analysis

The (SPSS version 20.0) was employed to test for the significance in variation of the observed results. For all statistical tests, $P < 0.05$ was considered as statistically significant. Diagnostic accuracy was measured by computing sensitivity, specificity, predictive values and likelihood ratios. The precision of these estimates were evaluated using 95% confidence intervals.

Results:

Table 1 -Shows that out of the 87 infected subjects, 34 (39.1%) are between the ages of 1 – 5 years, while 52 (59.8%) of the subjects were aged 6 years and above.

Table 2- Shows that of the 87 Screened for Malaria parasite infection 48 (55.2%) showed scanty infection, 25 (28.7%) showed moderate infection, and 13 (14.9%) showed heavy infection.

Table 3-Shows the association of age and level of parasitemia in the subjects.Out of the 34 subjects aged 1 – 5 years, 58.8% had scanty malaria, 26.5% has moderate malaria, and 14.7% had severe malaria. Out of the 52 subjects within age 6 and above, 53.8% had scanty malaria, 30.8% had moderate malaria, and 15.4% had severe malaria.

Table 4- Shows the association of gender and level of parasitemia in the subjects. Out of the 33 subjects that were females, 45.5% had scanty malaria, 36.4% has moderate malaria, and 18.2% had severe malaria. Out of the 53 subjects that are male, 62.3% had scanty malaria, 24.5% had moderate malaria, and 13.2% had severe malaria.

Table 1. Prevalence of malaria infection within age group.

		Age			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	1.1	1.1	1.1
	0-5 years	34	39.1	39.1	40.2
	6 and above	52	59.8	59.8	100.0
	Total	87	100.0	100.0	

Table 2. Distribution of infected subjects according to level of parasitemia.

		Level of Parasitemia			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	1.1	1.1	1.1
	MP (+)	48	55.2	55.2	56.3
	MP (++)	25	28.7	28.7	85.1
	MP (+++)	13	14.9	14.9	100.0
	Total	87	100.0	100.0	

Table 3. Cross-tabulation of Age and Level of Parasitemia in Subjects.

		Age * Malaria Result Cross tabulation				
		Malaria Result			Total	
		MP-(+)	MP-(++)	MP-(+++)		
Age	1-5 year	Count	20	9	5	34
		% within Age	58.8%	26.5%	14.7%	100.0%
	6 and above	Count	28	16	8	52
		% within Age	53.8%	30.8%	15.4%	100.0%

	% within Malaria Result	58.3%	64.0%	61.5%	60.5%
	Count	48	25	13	86
Total	% within Age	55.8%	29.1%	15.1%	100.0%
	% within Malaria Result	100.0%	100.0%	100.0%	100.0%

Table 4. Cross-tabulation of Gender and Level of Parasitemia in Subjects.

Gender * Malaria Result Cross tabulation						
		Malaria Result			Total	
		MP-(+)	MP-(++)	MP-(+++)		
Sex	Female	Count	15	12	6	33
		% within Sex	45.5%	36.4%	18.2%	100.0%
	Male	% within Malaria Result	31.2%	48.0%	46.2%	38.4%
		Count	33	13	7	53
Total	Female	% within Sex	62.3%	24.5%	13.2%	100.0%
		% within Malaria Result	68.8%	52.0%	53.8%	61.6%
	Male	Count	48	25	13	86
		% within Sex	55.8%	29.1%	15.1%	100.0%
	% within Malaria Result	100.0%	100.0%	100.0%	100.0%	

Discussion

The present study showed that malaria is a public health concern among children in the study area. The overall prevalence of malaria was 43.5% among children recruited for the study visiting the health care facility. The result from this study is invariably higher than what was obtained in a study conducted in Arsi Negele, Ethiopia with (22.8%) [13], also in a similar study conducted in Arba Minch Zuria District, South Ethiopia (22.1%) [1]. Similarly, in a survey conducted in some parts of Nigeria among children below five years (22.6%) prevalence was recorded [15], which was below the result of prevalence recorded in this study. Furthermore, the prevalence determined in this study showed a higher prevalence of malaria than in a study conducted in Mali with (35.4%) [16], and Cameroon with a prevalence of (28.8%) [17]. However, a study conducted in Ghana recorded a similar result (43.0%) [18], as obtained in this study. The observed differences with regards to the prevalence of malaria infection, may be due to the variations in geographical settings coupled with the malaria control and prevention programme put in place in the various regions and localities. It is of note that the level of prevalence recorded in this study, validates the fact that systematic reviews which assess the patterns of malaria infection by age with respect to its severity, level of transmission intensity of parasitaemia and seasonality in most sub-Saharan Africa validates that clinical malaria burden tends to be higher among the younger age groups.

Result obtained from this study is however in contrast to a study done in Wogera district, Ethiopia [19] and in Ziquala, Northeast Ethiopia [20]. Similar studies conducted among febrile children showed that children with a record of febrile illness and *Plasmodium* infection decreases with increase in age of the child, however in this study, the number of children who had febrile illness increases with increasing age of a child. This observed differences might be due to undue exposure of these children to malaria transmission in such endemic areas and coupled with a probable low or non-existent protective immunity as the resultant effects of malnutrition and possible continuous exposure to infective mosquito bites [21]. Most of the infected children from our study, recorded a low, followed by moderate and high parasitic density, which accounted for 58.3%, 41.7% (low parasitemia); 36%, 64% (Moderate parasitemia); 38.5%, 61.5% (High level of parasitaemia) of malaria positive children respectively, across the age range studied. This outcome is consistent with an earlier study done in South Gondar, Ethiopia, [21].

In contrast, a higher proportion of parasite density was obtained in a study conducted in East Central Tanzania [22], while a similar high proportion of low parasitic density was recorded in another study conducted in North-west Ethiopia. [23]. The im-

munological status of the children, age range, and dietary status of the study participants could all have an impact on the parasite density. [24].

Considering gender, it was observed that the prevalence of malaria infections among the children studied was more predominant among the males gender compared to the females. This differences observed may possibly be as a result of gender activities in most set up with regards to house hold chores, host genetic factors and other factors such as leisure activities observed by the males compared to the female gender. In highly endemic areas sleeping patterns may likely play some roles in the transmission process. [25]. In another survey conducted, It was suggested that Male children have the tendency of staying late outdoors without perhaps a proper protective clothing with the tendency not even desiring to sleep under a mosquito net. It has also been suggested in some findings that the male gender usually are prone to lower immune response than females [26], which may likely expose them to higher level of parasitaemia compare to the females. However, the immunological differences between gender may be linked to circulating steroid hormones such as testosterone, oestradiol, and progesterone which to some extent may elucidate the increased level of parasitaemia among the male subjects [26]. Further more it was observed in related studies that host hormones do not only influences infection responses, but also parasites in various hosts may also generate and modify hormone concentrations [27].

According to previous studies conducted, It was observed that some of these gender differences that affect disease outcomes includes possible access to vaccination, the level of the child access to proper nutrition, access to proper welfare and use of prophylactic therapy. Similarly, the availability and free access to preventive and curative health care facilities immensely influences the break in transmission rate and possibly gradual eradication of the parasite from the community, [28]. It is therefore pertinent that our understanding of how the various gender's patterns of behavior and how they influence on the exposure to mosquitoes bites can immeasurably assist in the development of more-effective strategy at preventing malaria infection among the various genders.

Among the study participants, 50.2% of parents showed some level of awareness of malaria infection preventive measures and established that stagnant water is a suitable breeding site for mosquitoes among other risk factor identified. Several studies have been able to prove that the density of vectors for malaria parasite transmission and living close to surroundings with stagnant water body such as rivers or streams could be a one of the major contributory factors that could influence malaria transmission in most localities and environs, [21].

This study validates the fact that children with the habits of staying outdoors late at night with adequate protective coverings in mosquito prone environments, have the greater chances of exposures to malaria infection compared to those that do not. The trend of keeping late night outdoors by parents and caregivers with their children showed a statistically significant association with malaria infection, which is in line with the findings of Aschale, *et al.*, [29] and Agegnehu *et al.*, [30] Similarly, Children whose parents of caregivers had no knowledge of the dangers of Malaria infection or its preventive measures seem to be at greater risk of infection compared to those who are well enlightened in this regard, [18,31]. Further studies would need to check the effects of Malaria infection on the haematological parameters of the study subjects to ensure precision and accuracy in therapy administration.

Conclusion

Outcome from our studies shows a high prevalence of malaria infection among the study subjects. Aside well-known risk factors of child malaria infection such as age-range of the children and lack of maternal formal education, the study also identified mother or caregivers exposure to parasitic infection as a notable risk factor. Therefore, apart from the need to improve on the distribution of treated mosquito to endemic communities nets as a preventive measure, the need for access to basic primary healthcare facilities for prompt malaria screening and treatment regimen is strongly ad-

vocated. Similarly, effective child malaria programmes by healthcare providers should also consider adopting appropriate preventive measures in mothers and pregnant women, while a well monitored Malaria control measures should equally be put in place especially in communities at high risk of malaria infection and transmission.

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