

The KAPP Study of Malaria and its Prevalence amongst Boarding School Students in Gboko Local Government Area of Benue State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NA and VUO managed the analyses of the study. Authors NA and VUO read and approved the final manuscript.

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ABSTRACT

Malaria is a life-threatening parasitic disease caused by a protozoan of the genus *Plasmodium* and is one of the most important parasitic diseases of man globally especially in sub-Saharan Africa. This research was done to assess malaria infection and its relationship with the knowledge, attitude, perception and prevention among students of boarding schools in Gboko Local Government Area. Five boarding schools within Gboko Local Government were selected for the study. A total of 370 students were sampled to represent the population. Malaria in the schools selected for this study was determined through malaria test via the examination of stained thick blood smears under the microscope. Structured questionnaires were administered to the participants to get information pertaining to their demography, knowledge, attitude, perception and preventive methods towards malaria. Thick blood films were stained using Romanowsky Field Stains. Chi-square was used for comparing infections and to determine the significant relationships at 95% level of significance. The

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results showed an overall prevalence of 20.8%. The prevalence of malaria was higher among female students (22.3%) than in male students (19.5%). Malaria was found most (10.8%) among students who use insecticide treated nets (ITNs). This study revealed that the knowledge and ownership of insecticide treated net (ITN) was high (86.2%) among the students. However, only 60.0% of the ITN owners actually use it. Thirteen percent of the students have phobia for the use of ITN while many students do not use the ITN for diverse perceived reasons. The treatment seeking behavior of the students showed that majority of the students (84.9%) access the school clinic when they have fever. This study has revealed that there are misconceptions on the knowledge of malaria among students and these are some of the factors leading to the risk and exposure of students to the bites of mosquitoes. The perceived beliefs on malaria in this study have no scientific basis and can easily be overcome through proper health education. Providing a mosquito free environment and promoting ITN usage as well as use of mosquito repellent cream among boarding school students may help achieve the desired protection against mosquito bites and subsequently prevent malaria.

Keywords: KAPP study; malaria; parasitic disease; plasmodium.

1. INTRODUCTION

Malaria is a deadly and life-threatening parasitic disease caused by a protozoan of the genus *Plasmodium* transmitted to people through the bites of female *Anopheles* mosquitoes [1-3].

Malaria has long been one of the most important parasitic disease of man, globally, malaria is an enormous public health problem especially in much of Sub-Saharan Africa affecting more than one billion people and causing between one and three million deaths each year [4,5]. Malaria now kills at least one million people each year, about 3000 a day and 9 out of 10 cases occur in Africa. Malaria also kills a child every 30 seconds [3]. Malaria is transmitted throughout Nigeria, with 97% of the population at risk [6].

Despite malaria being one of the largest public health problem in Africa South of Sahara with over one million associated deaths each year [7,4,5,3] there has been little progress in its prevention and control during the past decades. Thus, malaria has resurged in many parts of the tropics [1]. There are also problems of drug resistance by the parasite and insecticide resistance by the vectors [4]. Malaria sometimes prevents children from learning and the cost of malaria control and treatment drains schools of funds and lead to loss of learning hours.

A boarding school is a school which provides accommodation and meals to the students during the term. During this period, students are housed within the school premises in a hostel where they live as their home. The word KAPP as used in this study is an acronym for knowledge, attitude, perception and prevention.

In recent times, parasitologists have devoted a lot of research to understanding the interplay of community beliefs and behavior, knowledge, poverty and other cultural factors on disease prevalence and control [8]. Inadequate knowledge, misconceptions about the transmission, perception and management of malaria has been reported among various strata of the society and this can adversely affect malaria control measures [9].

The students from boarding schools tend to put up some behaviours which make them exposed to the bites of infected blood sucking female *Anopheles* mosquitoes. The refusal to use methods of prevention of malaria and long lasting insecticide treated nets (LLITN) by students for various reasons, perceptions and beliefs is of great importance to the spread of malaria. Most boarding schools may tend to be keen on their environmental sanitation and ways to prevent mosquito bites but a research by Udonwa et al. [10] and Aluh et al. [9] revealed that there are gaps in knowledge of malaria etiology among students.

The epidemiology of malaria among school children has previously received little attention, with few studies looking at factors associated with the risk among African school children. There is, therefore, need for robust data for all age-groups on the burden of malaria to inform planning of control programmes [11].

The aim of this study was to assess malaria infection and its relationship with the knowledge, attitude, perception and prevention among students of boarding schools in Gboko Local Government Area.

2. MATERIALS AND METHODS

2.1 Study Location

This study was carried out in Gboko Local Government Area of Benue State, Nigeria. The headquarters of the Local Government is Gboko town which has a population of 361,325 people as at the 2006 national population census. The inhabitants are mostly the Tiv people. It is located in the Guinea Savannah of Nigeria with two seasons each year (dry and wet seasons). The Latitude (in degrees, minutes and seconds) is 7°19'04"N and the Longitude (in degrees, minutes and seconds) is 8°59'42"E. As at the time of this research, there were 11 boarding secondary schools within the Local Government known to the researcher. Some of the schools were within the township area while others were located outside the town.

2.2 Study Design

Five boarding schools within Gboko Local Government were selected for the study through stratified random sampling. The schools were Queen of the Rosary Secondary School, Princess Adeja International College, St James Junior Seminary, Bristow Secondary School and Calvary Arrows College.

A total of 370 students were sampled to represent the population. This research was a

cross sectional study and was done within a period of three months (January – March, 2019) which was during the dry season.

2.3 Collection of Sample

Structured questionnaires were administered to the participants to get information pertaining to their demography, knowledge, attitude, perception and prevention methods towards malaria. The type of sample that was collected from the participants was blood. Blood was collected from participants at the school's clinic through capillary method as described by Cheesbrough [12].

2.4 Sample Analysis

Thick blood films were made at the school's clinic and allowed to air dry. The thick blood films were stained using Romanowsky Field Stains [13]. The dried slides were then put in a slide box and taken to the laboratory at Myom Hospital Gboko where they were viewed under the microscope for the presence of malaria parasites.

2.5 Result Analysis

The data generated was presented using descriptive statistics. Chi-square was used for comparing infections and to determine the significant relationship at 95% level of significance.

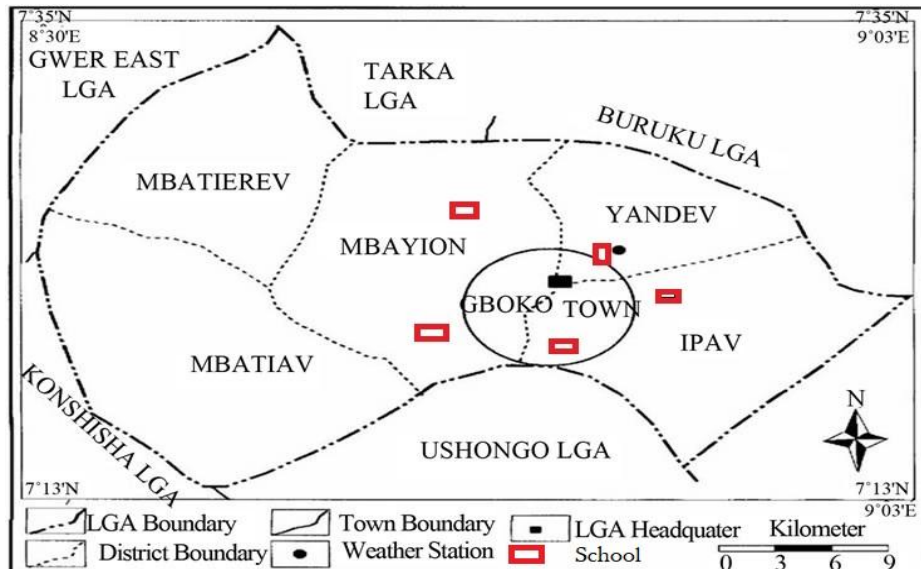


Fig. 1. Map of Gboko LGA
(Source: Google maps)

3. RESULTS

The overall prevalence of malaria was 20.8% (Table 1). There was no statistical significant difference in the infection among the schools sampled. The prevalence of malaria was higher among the female students (22.3%) than the male students (19.5%) as shown in Table 1. The most common source of information was parents (46.9%) followed by teachers (35.8%) while little came from hospital/school clinic (11.7%), television/radio (4.3%) and others (1.4%). There was no statistical significant difference in the source of knowledge about malaria among the male and female students ($\chi^2 = 9.305$, $df = 4$, $P = 0.054$). Majority of the students (86.2%) own insecticide treated net (ITN) but not all of them (only 60.0%) actually use it. More infections were found among students who use ITN (10.8%) than those who do not use it (10.0%) however, there was no statistical significant difference in the infection among those who use ITN and those who do not use it ($\chi^2 = 2.627$, $df = 1$, $P = 0.105$). The attitude of the students also showed that 173 students read in the class at late hours after the night prep out of which 109 (63.0%) use no protection against mosquito bites (Table 2). Most students failed to identify the real cause of malaria as a protozoan (Table 3). Majority of the

students 352 (95.1%) recognized that malaria is transmitted by the bites of female *Anopheles* mosquitoes, however, other students said it is airborne (2.7%), by standing under the sun (0.5%), through sexual intercourse (0.3%) while some had no idea (1.4%). There was no statistical significant difference in the perceived mode of transmission of malaria among the male and female students ($\chi^2 = 3.048$, $df = 4$, $P = 0.550$). Students gave varying reasons as to why they do not use insecticide treated net that is produces heat (24.1%), non-availability (7.6%), high cost of ITN (0.5%), it is used to cover dead bodies (0.5%) and other reasons (7.0%) while some students (13.5%) had phobia for the use of ITN. The most method of preventing malaria used by the students was ITN (59.5%) then clearing of drainages (21.9%) followed by use of insecticide (11.9%) while the least was the use of mosquito repellants (6.8%). There was no statistical significant difference in the method used to prevent malaria among the male and female students (Table 4). The treatment seeking behavior of the students showed that majority of the students (84.9%) access the school clinic when they have fever. Some of the students (12.7%) resort to self-medication while very little number of students (2.4%) prefer to do nothing.

Table 1. Prevalence of malaria in the schools sampled

Schools	Sex				Total (n=370)	
	Male (n=195)		Female (n=175)		Number examined	Number infected
	Number examined	Number infected	Number examined	Number infected		
Queen of the Rosary Secondary School	0	0	74	20 (11.4%)	74	20 (5.4%)
Princess Adeja International College	39	7 (3.6%)	35	6 (3.4%)	74	13 (3.5%)
St James Junior Seminary	74	15 (7.7%)	0	0	74	15 (4.1%)
Bristow Secondary School	43	5 (2.6%)	31	6 (3.4%)	74	11 (3.0%)
Calvary Arrows College	39	11 (5.6%)	35	7 (4.1%)	74	18 (4.9%)
Total	195	38 (19.5%)	175	39 (22.3%)	370	77 (20.8%)

For sex: $\chi^2 = 149.735$, $df = 4$, $P < 0.05$; For total: $\chi^2 = 4.362$, $df = 4$, $P = 0.359$

Table 2. Methods used to prevent mosquito bites by students who read at late hours after the night prep

Sex of student	Protection used against mosquito bite			Total
	Long sleeved shirts and trousers	Mosquito repellent cream	None	
Male	18 (10.4%)	13 (7.5%)	53 (30.6%)	84 (48.6%)
Female	9 (5.2%)	24 (13.9%)	56 (32.4%)	89 (51.4%)
Total	27 (15.6%)	37 (21.4%)	109 (63.0%)	173 (100.0%)

$\chi^2 = 6.214$, $df = 2$, $P = 0.045$

Table 3. Perceived cause of malaria in relation to the sex of students

Cause of malaria	Sex		Total
	Male	Female	
Protozoan	36 (9.7%)	25 (6.8%)	61 (16.5%)
Virus	3 (0.8%)	1 (0.3%)	4 (1.1%)
Mosquitoes	155 (41.9%)	146 (39.5%)	301 (81.4%)
No Idea	1 (0.3%)	3 (0.8%)	4 (1.1%)
Total	195(52.7%)	175(47.3%)	370(100.0%)

$\chi^2 = 3.181, df = 3, P = 0.365$

Table 4. Sex related prevention activities of the students

Sex	How students prevent malaria				Total
	ITN	Mosquito repellants	Insecticide sprays	Clear all drainages	
Male	116 (31.4%)	11 (3.0%)	25 (6.8%)	43 (11.6%)	195 (52.7%)
Female	104 (28.1%)	14 (3.8%)	19 (5.1%)	38 (10.3%)	175 (47.3%)
Total	220(59.5%)	25(6.8%)	44(11.9%)	81(21.9%)	370(100.0%)

$\chi^2 = 1.063, df = 3, P = 0.786$

4. DISCUSSION

The prevalence in this study is low as compared to high prevalence reported by Abah and Temple [14] and that of Adepeju [15] among students to be 63.3% and 80.3% respectively. The malaria which was higher among female students than in male students is contrary to other reports which showed higher prevalence among male students than the female students [14,15,11].

The knowledge of the students on the transmission of malaria and methods of prevention was high. This agrees with a study carried among secondary school students in Morogoro District, Tanzania where the researcher reported that most of the pupils in the study knew at least one form of malaria transmission and had used at least one method of malaria prevention [16]. The most common source of information in this study was parents. This shows that the role of social and mass media in disseminating information about malaria has not been fully utilized in this part of the country. This result however, disagrees with reports elsewhere that the main source of information on malaria among students was commonly through mass media followed by teachers [16,17,10].

This study revealed that the knowledge and ownership of ITN was high. However, not all those who owned ITN were actually using it. This finding is similar to the result obtained from boarding students in Zaria, northern Nigeria where it was reported that the knowledge and awareness of ITNs among secondary school students was high (87.3%), however, the usage

among the respondents was very low (43.3%) [7]. Similar report was also given in a research conducted in western Kenya [11]. Also similar findings have been reported in Morogoro District, Tanzania [16].

There were some misconceptions about the real cause of malaria and its transmission. This is similar to the result among secondary school students in Morogoro District, Tanzania [16] and in Calabar, Cross River State, Nigeria [10] where it was reported that the knowledge on the real cause of malaria was low. Majority of the students recognized that malaria is transmitted by the bites of female *Anopheles* mosquitoes, however, few students had other perceptions.

In this study, students gave varying reasons as to why they do not use insecticide treated net while some students have phobia for the use of insecticide treated nets while some use traditional herbs to treat malaria. These beliefs are consequential and tend to affect the prevention of malaria through the use of insecticide treated nets (ITNs). The decreased use of ITNs suggests low prevention of malaria and hence higher risk of malaria infection. This gap in malaria etiology has been reported by Aluh et al. [9] and Udonwa et al. [10]. Furthermore, inadequate knowledge, misconceptions about the transmission, perception and management of malaria can adversely affect malaria control measures [9].

The most used method to prevent malaria by the students was use of ITN. Yet malaria infection was found most among students who use ITN

than in those who do not use it. This result agrees with the findings among students in Akure, Ondo State, Nigeria [15]. This is possible as the attitude of the students can lead to infection. The malaria infection can be acquired during night prep or reading late hours as 173 (46.8%) students agreed to reading in the class at late hours and most of them use no protection from mosquito bites. Therefore, even if they return to the hostel to sleep under an insecticide treated net, they may still be infected with malaria as a result of the mosquito bites from the class rooms.

The treatment seeking behavior of the students showed that majority of the students (84.9%) go to the school clinic when they have a fever. This result indicates the satisfactory medical services given to the students at the school clinics to have such percentage of preference. Some of the students resort to self-medication where they prefer to buy drugs and take while very little number of students prefer to do nothing. This result is similar with the findings among boarding school students in Owerri, Imo State, Nigeria, that students self-medicated and readily obtained pharmaceuticals without prior medical consultation [18]. Also self-medication among secondary school students was reported in Akure, Ondo State [17]. This habit is not recommendable as these students may tend to take less than the recommended doses.

5. CONCLUSION

This study has revealed that there are some misconceptions about the cause of malaria, its transmission and ways of prevention. There are certainly other factors leading to the risk and exposure of students to the bites of mosquitoes thereby causing malaria transmission and related burden in boarding schools. These factors are not far from the attitudes and perceptions revealed in this study. It is important to note that for malaria control measures to be effective, both asymptomatic and symptomatic individuals must be included in the management strategies.

6. RECOMMENDATIONS

Promoting insecticide treated net (ITN) usage and use of mosquito repellent cream among boarding school students may help to achieve the desired protection against mosquito bites. There is need to include school children in standard malaria interventions, which may alleviate the observed malaria burden. Also the use of ITN should be incorporated into school

health policy as well as a school health policy against self-medication. All three tiers of Government needs to make ITNs available, affordable, and sustainable. There is also need to ensure efficient and effective distribution networks (to include boarding school students) for easy access of ITNs.

Efforts have to be undertaken through different means of communications to provide information on malaria prevention to boarding school children as they have some gaps in the knowledge on malaria and are likely to suffer from its complications.

Finally, there is need for school managements to provide a mosquito free environment by putting window nettings on the windows of the hostels and class rooms as most exposures to mosquito bites are from the class rooms during night study. The doors should be closed and only open when need be. And proper drainage systems should be built to enable free flow of water so as to avoid the situation of water being held at certain places.

CONSENT AND ETHICAL APPROVAL

A letter of introduction was obtained from the department of Biological Sciences, Benue State University Makurdi for the study. Ethical clearance was obtained from Benue State Ministry of Health and Human Services and Benue State Ministry of Education, Science and Technology for the study. Also, permission to carry out the research was obtained through written communication to the Principals of the respective schools sampled for the study. Informed and verbal consent was sought from the study participants prior to their participation in the research.

Inclusion criteria: Students who gave their consent for this study irrespective of having symptoms or no symptoms of malaria.

Exclusion criteria: Students who were on anti-malarial drugs or had taken any within two weeks prior to sample collection and also those who declined consent.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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