

1 **THE KAPP STUDY OF MALARIA INFECTION AND ITS PREVALENCE**
2 **AMONGST BOARDING SCHOOL STUDENTS IN GBOKO LOCAL GOVERNMENT**
3 **AREA OF BENUE STATE, NIGERIA**

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7 **ABSTRACT**

8 Malaria is a life-threatening parasitic disease caused by a protozoan of the genus *Plasmodium*
9 and is one of the most important parasitic diseases of man globally especially in sub-Saharan
10 Africa. This research was done to assess malaria infection and its relationship with the
11 knowledge, attitude, perception and prevention among students of boarding schools in Gboko
12 Local Government Area. Five boarding schools within Gboko Local Government were
13 selected for the study. A total of 370 students were sampled to represent the population.
14 Malaria infection in the schools selected for this study was determined through malaria test via
15 the examination of stained thick blood smears under the microscope. Structured questionnaires
16 were administered to the participants to get information pertaining to their demography,
17 knowledge, attitude, perception and preventive methods towards malaria. Thick blood films
18 were stained using Romanowsky Field Stains. Chi-square was used for comparing infections
19 and to determine the significant relationships at 95% level of significance. The results showed
20 an overall prevalence of 20.8%. The prevalence of malaria infection was higher among female
21 students (22.3%) than in male students (19.5%). Malaria infection was found most (10.8%)
22 among students who use insecticide treated nets (ITNs). This study revealed that the
23 knowledge and ownership of insecticide treated net (ITN) was high (86.2%) among the
24 students. However, only 60.0% of the ITN owners actually use it. Thirteen percent of the
25 students have phobia for the use of ITN while many students do not use the ITN for diverse
26 perceived reasons. The treatment seeking behavior of the students showed that majority of the
27 students (84.9%) access the school clinic when they have fever. This study has revealed that
28 there are misconceptions on the knowledge of malaria among students and these are some of
29 the factors leading to the risk and exposure of students to the bites of mosquitoes. The
30 perceived beliefs on malaria in this study have no scientific basis and can easily be overcome
31 through proper health education. Providing a mosquito free environment and promoting ITN
32 usage as well as use of mosquito repellent cream among boarding school students may help
33 achieve the desired protection against mosquito bites and subsequently prevent malaria.

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36 **INTRODUCTION**

37 Malaria is a deadly and life-threatening parasitic disease caused by a protozoan of the genus
38 *Plasmodium* transmitted to people through the bites of female *Anopheles* mosquitoes [8,9,18].

39 Malaria has long been one of the most important parasitic disease of man, globally, malaria is
40 an enormous public health problem especially in much of Sub-Saharan Africa affecting more
41 than one billion people and causing between one and three million deaths each year [11,14].
42 Malaria now kills at least one million people each year, about 3000 a day, and 9 out of 10 cases

43 occur in Africa. Malaria also kills a child every 30 seconds [18]. Malaria is transmitted
44 throughout Nigeria, with 97% of the population at risk [15].

45 Despite malaria being one of the largest public health problem in Africa South of Sahara with
46 over one million associated deaths each year [3,11,14,18], there has been little progress in its
47 prevention and control during the past decades. Thus, malaria has resurged in many parts of the
48 tropics [8]. There is also problems of drug resistance by the parasite and insecticide resistance
49 by the vectors [11]. Malaria sometimes prevent children from learning and the cost of malaria
50 control and treatment drains schools of funds and lead to loss of learning hours.

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

55 In recent times, parasitologists have devoted a lot of research to understanding the interplay of
56 community beliefs and behavior, knowledge, poverty and other cultural factors on disease
57 prevalence and control [13]. Inadequate knowledge, misconceptions about the transmission,
58 perception and management of malaria has been reported among various strata of the society
59 and this can adversely affect malaria control measures [4].

60 The students from boarding schools tend to put up some behaviours which make them exposed
61 to the bites of infected blood sucking female *Anopheles* mosquitoes. The refusal to use
62 methods of prevention of malaria and long lasting insecticide treated nets (LLITN) by students
63 for various reasons, perceptions and beliefs is of great importance to the spread of malaria.
64 Most boarding schools may tend to be keen on their environmental sanitation and ways to
65 prevent mosquito bites but a research by [17] and [4] revealed that there are gaps in knowledge
66 of malaria etiology among students.

67 The epidemiology of malaria among school children has previously received little attention,
68 with few studies looking at factors associated with the risk among African school children.
69 There is, therefore, need for robust data for all age-groups on the burden of malaria to inform
70 planning of control programmes[16].

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

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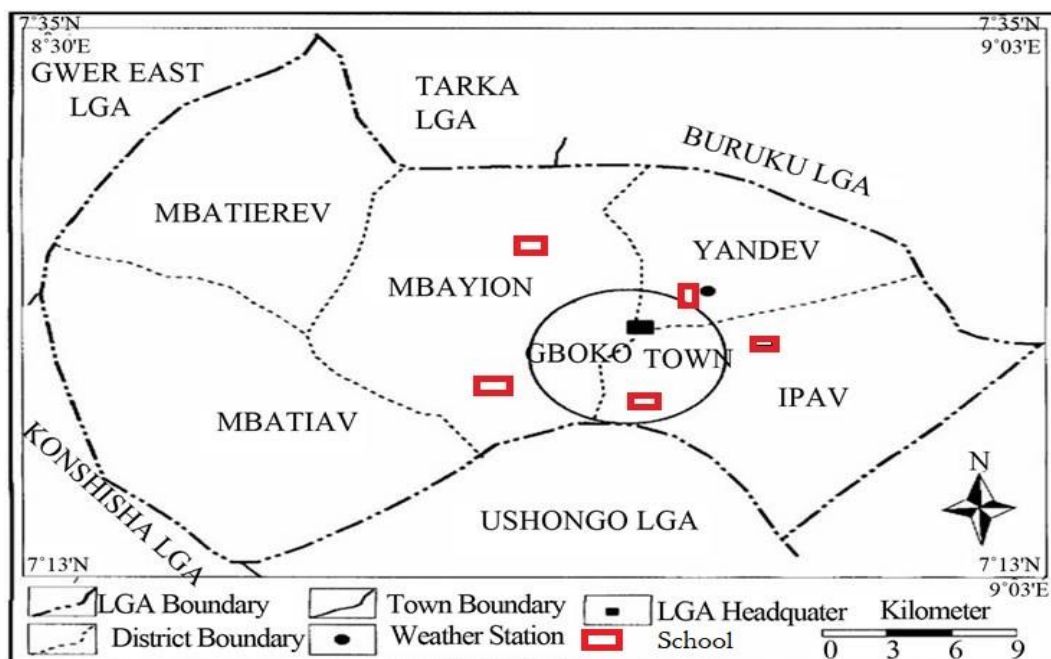
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76 **MATERIALS AND METHODS**

77 **Study Location**

78 This study was carried out in Gboko Local Government Area of Benue State, Nigeria. The
79 headquarters of the Local Government is Gboko town which has a population of 361,325
80 people as at the 2006 national population census. The inhabitants are mostly the Tiv people. It
81 is located in the Guinea Savanah of Nigeria with two seasons each year (dry and wet seasons).

82 The Latitude (in degrees, minutes and seconds) is 7°19'04"N and the Longitude (in degrees,
 83 minutes and seconds) is 8°59'42"E. As at the time of this research, there were 11 boarding
 84 secondary schools within the Local Government known to the researcher. Some of the schools
 85 were within the township area while others were located outside the town.



86
 87 Figure 1: Map of Gboko LGA (Source: Google maps)

88 **Ethical Consideration**

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

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

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

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 102 **Study Design**

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

107 A total of 370 students were sampled to represent the population. This research was a cross
108 sectional study and was done within a period of three months (January – March, 2019) which
109 was during the dry season.

110 **Collection of Sample**

111 Structured questionnaires were administered to the participants to get information pertaining to
112 their demography, knowledge, attitude, perception and prevention methods towards malaria.
113 The type of sample that was collected from the participants was blood. Blood was collected
114 from participants at the school's clinic through capillary method as described in[6].

115 **Sample Analysis**

116 Thick blood films were made at the school's clinic and allowed to air dry. The thick blood
117 films were stained using Romanowsky Field Stains [5]. The dried slides were then put in a
118 slide box and taken to the laboratory at Myom Hospital Gboko where they were viewed under
119 the microscope for the presence of malaria parasites.

120 **Result Analysis**

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

123 **RESULTS**

124 The overall prevalence of malaria was 20.8% (Table 1). There was no statistical significant
125 difference in the infection among the schools sampled. The prevalence of malaria was higher
126 among the female students (22.3%) than the male students (19.5%) as shown in Table 2. Table
127 3 shows that the most common source of information was parents (46.9%) followed by
128 teachers (35.8%) while little came from hospital/school clinic (11.7%), television/radio (4.3%)
129 and others (1.4%). There was no statistical significant difference in the source of knowledge
130 about malaria among the male and female students. Majority of the students own insecticide
131 treated net (ITN) but not all of them actually use it (Table 4). More infections were found
132 among students who use ITN than those who do not use it (Table 5). There was no statistical
133 significant difference in the malaria infection among those who use ITN and those who do not
134 use it. The attitude of the students also showed that 173 students read in the class at late hours
135 out of which 109 (63.0%) use no protection against mosquito bites (Table 6). Most students
136 failed to identify the real cause of malaria as a protozoan (Table 7). Majority of the students
137 352 (95.1%) recognized that malaria is transmitted by the bites of female *Anopheles*
138 mosquitoes, however, other students had other perceptions (Table 8). There was no statistical
139 significant difference in the perceived mode of transmission of malaria among the male and
140 female students. Students gave varying reasons as to why they do not use insecticide treated
141 net as shown in Table 9. The results also showed that some students have phobia for the use of
142 ITN while some use traditional herbs to treat malaria. The most method of preventing malaria
143 used by the students was ITN (59.5%) then clearing of drainages (21.9%) followed by use of
144 insecticide (11.9%) while the least was the use of mosquito repellants (6.8%). There was no
145 statistical significant difference in the method used to prevent malaria among the male and
146 female students (Table 10).

147 **Table 1: Prevalence of malaria infection in the schools sampled for the study**

Schools	Number examined	Number infected
Queen of the Rosary Secondary School	74	20 (5.4%)
Princess Adeja International College	74	13 (3.5%)
St James Junior Seminary	74	15 (4.1%)
Bristow Secondary School	74	11 (3.0%)
Calvary Arrows College	74	18 (4.9%)
Total	370	77 (20.8%)

148 $\chi^2 = 4.362$, df = 4, P = 0.359

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150

151 **Table 2: Prevalence of malaria infection according to the sex of students in the schools**
 152 **sampled**

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

153 $\chi^2 = 149.735$, df = 4, P < 0.05

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156 **Table 3: Student's source of knowledge on malaria**

Source	Sex of student		Total
	Male	Female	

Teachers	72 (19.5%)	60 (16.3%)	132 (35.8%)
Parents	84 (22.8%)	89 (24.1%)	173 (46.9%)
Television/Radio	12 (3.3%)	4 (1.1%)	16 (4.3%)
Hospital/School Clinic	21 (5.7%)	22 (6.0%)	43 (11.7%)
Others	5 (1.4%)	0 (0.0%)	5 (1.4%)
Total	194(52.6%)	175(47.4%)	369(100.0%)

157 $\chi^2 = 9.305$, df = 4, P = 0.054

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161 **Table 4: Attitude of students towards ownership and use of mosquito net**

Use of ITN	Ownership of ITN		Total
	Yes	No	
Yes	222 (60.0%)	0 (0.0%)	222 (60.0%)
No	97 (26.2%)	51 (13.8%)	148 (40.0%)
Total	319 (86.2%)	51 (13.8%)	370 (100.0%)

162 $\chi^2 = 88.73$, df = 1, P < 0.05

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165 **Table 5: Prevalence of malaria in relation to the use of mosquito net**

Use of ITN	Number Examined	Number Infected
Yes	222	40 (10.8%)
No	148	37 (10.0%)
Total	370	77 (20.8%)

166 $\chi^2 = 2.627$, df = 1, P = 0.105

167

168 **Table 6: Methods used to prevent mosquito bites by students who read at late hours**

Sex of student	Protection used against mosquito bite			Total
	Long sleeved shirts and	Mosquito repellent	None	

	trousers	cream		
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%)

169 $\chi^2 = 6.214$, df = 2, P = 0.045

170

171 **Table 7: 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%)

172 $\chi^2 = 3.181$, df = 3, P = 0.365

173

174 **Table 8: Perceived transmission of malaria in relation to the sex of students**

Mode of Transmission	Sex of student		Total
	Male	Female	
Standing under the sun	1 (0.3%)	1 (0.3%)	2 (0.5%)
Air Borne	4 (1.1%)	6 (1.6%)	10 (2.7%)
Bites of female <i>Anopheles</i> mosquito	185 (50.0%)	167 (45.1%)	352 (95.1%)
Sexual Intercourse	1 (0.3%)	0 (0.0%)	1 (0.3%)
No Idea	4 (1.1%)	1 (0.3%)	5 (1.4%)
Total	195(52.7%)	175(47.3%)	370(100.0%)

175 $\chi^2 = 3.048$, df = 4, P = 0.550

176 **Table 9: Perception related prevalence of malaria**

Reason for not using mosquito net	Number Examined	Number Infected
Produces heat	89	23 (25.8%)

Used to cover dead bodies	2	1 (50.0%)
Non-availability	28	6 (21.4%)
High cost of mosquito nets	2	0 (0%)
Others	26	7 (26.9%)
Phobia for using mosquito net		
Yes	50 (13.5%)	9 (18.0%)
No	320 (86.5%)	68 (21.3%)

177 $\chi^2 = 1.599$, df = 4, P = 0.809; $\chi^2 = 0.277$, df = 1, P = 0.599

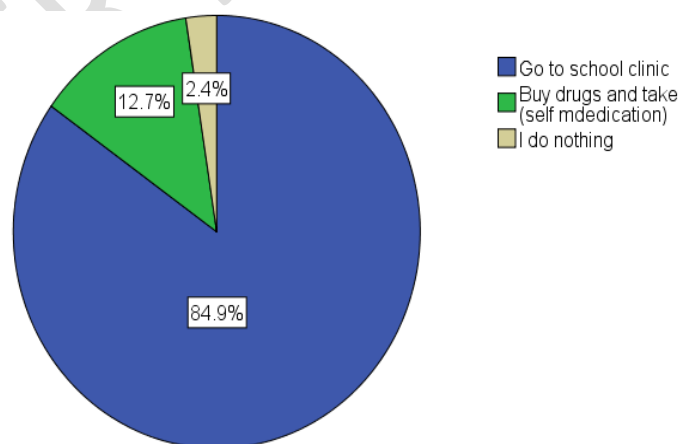
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179 **Table 10: Sex related prevention activities of the students**

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%)

180 $\chi^2 = 1.063$, df = 3, P = 0.786

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182

183 **Figure2: Treatment seeking behavior of students**

184 **DISCUSSION**

185 The prevalence in this study is low as compared to high prevalence reported by [1] and that of
 186 [2] among students to be 63.3% and 80.3% respectively. The malaria infection which was

187 higher among female students than in male students is contrary to other reports which showed
188 higher prevalence among male students than the female students[1,2,16].

189 The knowledge of the students on the transmission of malaria and methods of prevention was
190 high. This agrees with a study carried among secondary school students in Morogoro District,
191 Tanzania where the researcher reported that most of the pupils in the study knew at least one
192 form of malaria transmission and had used at least one method of malaria prevention [10]. The
193 most common source of information in this study was parents. This shows that the role of
194 social and mass media in disseminating information about malaria has not been fully utilized in
195 this part of the country. This result however, disagrees with reports elsewhere that the main
196 source of information on malaria among students was commonly through mass media followed
197 by teachers [10,12,17].

198 This study revealed that the knowledge and ownership of ITN was high. However, not all those
199 who owned ITN were actually using it. This finding is similar to the result obtained from
200 boarding students in Zaria, northern Nigeria where it was reported that the knowledge and
201 awareness of ITNs among secondary school students was high (87.3%), however, the usage
202 among the respondents was very low (43.3%) [3]. Similar report was also given in a research
203 conducted in western Kenya [16]. Also similar findings have been reported in Morogoro
204 District, Tanzania[10].

205 There were some misconceptions about the real cause of malaria and its transmission. This is
206 similar to the result among secondary school students in Morogoro District, Tanzania[10] and
207 in Calabar, Cross River State, Nigeria[17] where it was reported that the knowledge on the real
208 cause of malaria was low. Majority of the students recognized that malaria is transmitted by the
209 bites of female *Anopheles* mosquitoes, however, few students had other perceptions.

210 In this study, students gave varying reasons as to why they do not use insecticide treated net
211 while some students have phobia for the use of insecticide treated nets while some use
212 traditional herbs to treat malaria. These beliefs are consequential and tend to affect the
213 prevention of malaria through the use of insecticide treated nets (ITNs). The decreased use of
214 ITNs suggests low prevention of malaria and hence higher risk of malaria infection. This gap
215 in malaria etiology has been reported by [4] and [17]. Furthermore, inadequate knowledge,
216 misconceptions about the transmission, perception and management of malaria can adversely
217 affect malaria control measures [4].

218 The most used method to prevent malaria by the students was use of ITN. Yet malaria infection
219 was found most among students who use ITN than in those who do not use it. This result
220 agrees with the findings among students in Akure, Ondo State, Nigeria[2]. This is possible as
221 the attitude of the students can lead to infection. The malaria infection can be acquired during
222 night prep or reading late hours as 173 (46.8%) students agreed to reading in the class at late
223 hours and most of them use no protection from mosquito bites. Therefore, even if they return to
224 the hostel to sleep under an insecticide treated net, they may still be infected with malaria as a
225 result of the mosquito bites from the class rooms.

226 The treatment seeking behavior of the students showed that majority of the students (84.9%) go
227 to the school clinic when they have a fever. This result indicates the satisfactory medical
228 services given to the students at the school clinics to have such percentage of preference. Some

229 of the students resort to self-medication where they prefer to buy drugs and take while very
230 little number of students prefer to do nothing. This result is similar with the findings among
231 boarding school students in Owerri, Imo State, Nigeria, that students self-medicated and
232 readily obtained pharmaceuticals without prior medical consultation [7]. Also self-medication
233 among secondary school students was reported in Akure, Ondo State [12]. This habit is not
234 recommendable as these students may tend to take less than the recommended doses.

235 **CONCLUSION**

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

243 **RECOMMENDATIONS**

244 Promoting insecticide treated net (ITN) usage and use of mosquito repellent cream among
245 boarding school students may help to achieve the desired protection against mosquito bites.
246 There is need to include school children in standard malaria interventions, which may alleviate
247 the observed malaria burden. Also the use of ITN should be incorporated into school health
248 policy as well as a school health policy against self-medication. All three tiers of Government
249 needs to make ITNs available, affordable, and sustainable. There is also need to ensure
250 efficient and effective distribution networks (to include boarding school students) for easy
251 access of ITNs.

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

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

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