

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

4  
5 **Amagu, N., Obisike, U. V. and Amuta, E. U.**

6  
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 in the schools selected for this study was determined through malaria test via the  
15 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 was higher among female students  
21 (22.3%) than in male students (19.5%). Malaria was found most (10.8%) among students who  
22 use insecticide treated nets (ITNs). This study revealed that the knowledge and ownership of  
23 insecticide treated net (ITN) was high (86.2%) among the students. However, only 60.0% of  
24 the ITN owners actually use it. Thirteen percent of the students have phobia for the use of ITN  
25 while many students do not use the ITN for diverse perceived reasons. The treatment seeking  
26 behavior of the students showed that majority of the students (84.9%) access the school clinic  
27 when they have fever. This study has revealed that there are misconceptions on the knowledge  
28 of malaria among students and these are some of the factors leading to the risk and exposure of  
29 students to the bites of mosquitoes. The perceived beliefs on malaria in this study have no  
30 scientific basis and can easily be overcome through proper health education. Providing a  
31 mosquito free environment and promoting ITN usage as well as use of mosquito repellent  
32 cream among boarding school students may help achieve the desired protection against  
33 mosquito bites and subsequently prevent malaria.

34  
35  
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 are also problems of drug resistance by the parasite and insecticide resistance  
49 by the vectors [11]. Malaria sometimes prevents 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 Udonwa *et al* [17] and Aluh *et al* [4] revealed that  
66 there are gaps in knowledge 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.

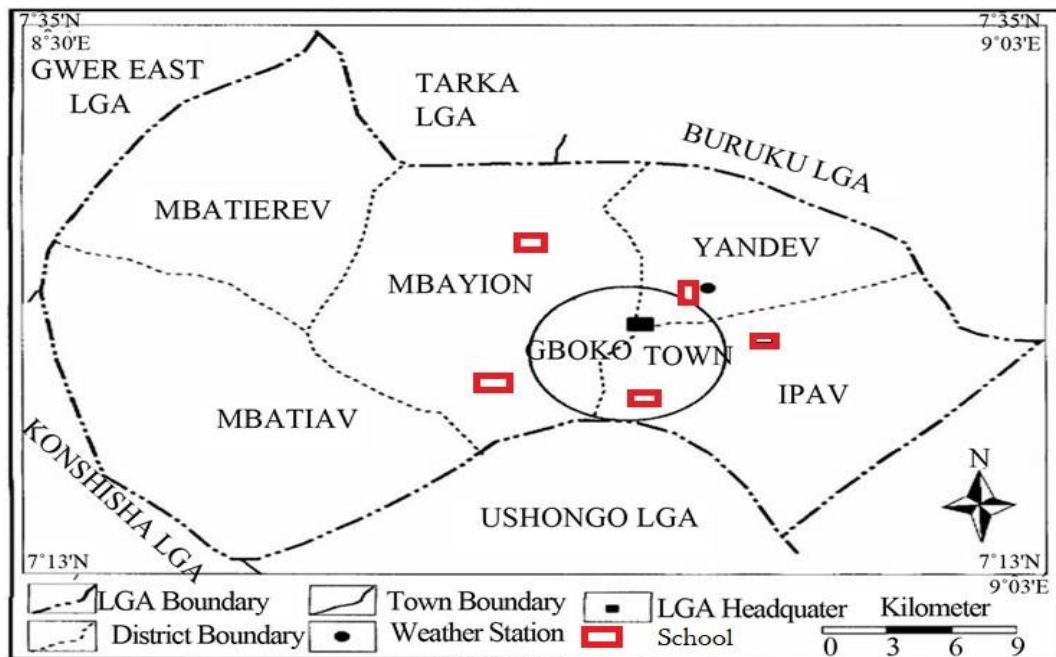
74

## 75 MATERIALS AND METHOD

### 76 Study Location

77 This study was carried out in Gboko Local Government Area of Benue State, Nigeria. The  
78 headquarters of the Local Government is Gboko town which has a population of 361,325  
79 people as at the 2006 national population census. The inhabitants are mostly the Tiv people. It  
80 is located in the Guinea Savanah of Nigeria with two seasons each year (dry and wet seasons).  
81 The Latitude (in degrees, minutes and seconds) is 7°19'04"N and the Longitude (in degrees,  
82 minutes and seconds) is 8°59'42"E. As at the time of this research, there were 11 boarding

83 secondary schools within the Local Government known to the researcher. Some of the schools  
84 were within the township area while others were located outside the town.



85

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

87

### 88 Study Design

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

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

### 96 Collection of Sample

97 Structured questionnaires were administered to the participants to get information pertaining to  
98 their demography, knowledge, attitude, perception and prevention methods towards malaria.  
99 The type of sample that was collected from the participants was blood. Blood was collected  
100 from participants at the school's clinic through capillary method as described by Cheesbrough  
101 [6].

### 102 Sample Analysis

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

### 107 Result Analysis

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

110

111 **RESULTS**

112 The overall prevalence of malaria was 20.8% (Table 1). There was no statistical significant  
 113 difference in the infection among the schools sampled. The prevalence of malaria was higher  
 114 among the female students (22.3%) than the male students (19.5%) as shown in Table 1. The  
 115 most common source of information was parents (46.9%) followed by teachers (35.8%) while  
 116 little came from hospital/school clinic (11.7%), television/radio (4.3%) and others (1.4%).  
 117 There was no statistical significant difference in the source of knowledge about malaria among  
 118 the male and female students ( $\chi^2 = 9.305$ ,  $df = 4$ ,  $P = 0.054$ ). Majority of the students (86.2%)  
 119 own insecticide treated net (ITN) but not all of them (only 60.0%) actually use it. More  
 120 infections were found among students who use ITN (10.8%) than those who do not use it  
 121 (10.0%) however, there was no statistical significant difference in the infection among those  
 122 who use ITN and those who do not use it ( $\chi^2 = 2.627$ ,  $df = 1$ ,  $P = 0.105$ ). The attitude of the  
 123 students also showed that 173 students read in the class at late hours after the night prep out of  
 124 which 109 (63.0%) use no protection against mosquito bites (Table 2). Most students failed to  
 125 identify the real cause of malaria as a protozoan (Table 3). Majority of the students 352  
 126 (95.1%) recognized that malaria is transmitted by the bites of female *Anopheles* mosquitoes,  
 127 however, other students said it is airborne (2.7%), by standing under the sun (0.5%), through  
 128 sexual intercourse (0.3%) while some had no idea (1.4%). There was no statistical significant  
 129 difference in the perceived mode of transmission of malaria among the male and female  
 130 students ( $\chi^2 = 3.048$ ,  $df = 4$ ,  $P = 0.550$ ). Students gave varying reasons as to why they do not  
 131 use insecticide treated net that is produces heat (24.1%), non-availability (7.6%), high cost of  
 132 ITN (0.5%), it is used to cover dead bodies (0.5%) and other reasons (7.0%) while some  
 133 students (13.5%) had phobia for the use of ITN. The most method of preventing malaria used  
 134 by the students was ITN (59.5%) then clearing of drainages (21.9%) followed by use of  
 135 insecticide (11.9%) while the least was the use of mosquito repellants (6.8%). There was no  
 136 statistical significant difference in the method used to prevent malaria among the male and  
 137 female students (Table 4). The treatment seeking behavior of the students showed that majority  
 138 of the students (84.9%) access the school clinic when they have fever. Some of the students  
 139 (12.7%) resort to self-medication while very little number of students (2.4%) prefer to do  
 140 nothing.

141 **Table 1: Prevalence of malaria in the schools sampled**

Schools	Sex				Total (n=370)	
	Male (n=195)		Female (n=175)		Number	Number
	Number Examined	Number Infected	Number Examined	Number Infected	Examined	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%)

<b>St James Junior Seminary</b>	74	15 (7.7%)	0	0	74	15 (4.1%)
<b>Bristow Secondary School</b>	43	5 (2.6%)	31	6 (3.4%)	74	11 (3.0%)
<b>Calvary Arrows College</b>	39	11 (5.6%)	35	7 (4.1%)	74	18 (4.9%)
<b>Total</b>	<b>195</b>	<b>38 (19.5%)</b>	<b>175</b>	<b>39 (22.3%)</b>	<b>370</b>	<b>77 (20.8%)</b>

142 For sex:  $\chi^2 = 149.735$ , df = 4, P < 0.05

143 For total:  $\chi^2 = 4.362$ , df = 4, P = 0.359

144

145 **Table 2: Methods used to prevent mosquito bites by students who read at late hours after**  
 146 **the night prep**

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

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

148

149

150

151

152 **Table 3: Perceived cause of malaria in relation to the sex of students**

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

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

154  
155  
156

**Table 4: Sex related prevention activities of the students**

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

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

158

## 159 DISCUSSION

160 The prevalence in this study is low as compared to high prevalence reported by Abah and  
161 Temple [1] and that of Adepeju [2] among students to be 63.3% and 80.3% respectively. The  
162 malaria which was higher among female students than in male students is contrary to other  
163 reports which showed higher prevalence among male students than the female students  
164 [1,2,16].

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

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

181 There were some misconceptions about the real cause of malaria and its transmission. This is  
182 similar to the result among secondary school students in Morogoro District, Tanzania [10] and  
183 in Calabar, Cross River State, Nigeria [17] where it was reported that the knowledge on the

184 real cause of malaria was low. Majority of the students recognized that malaria is transmitted  
185 by the bites of female *Anopheles* mosquitoes, however, few students had other perceptions.

186 In this study, students gave varying reasons as to why they do not use insecticide treated net  
187 while some students have phobia for the use of insecticide treated nets while some use  
188 traditional herbs to treat malaria. These beliefs are consequential and tend to affect the  
189 prevention of malaria through the use of insecticide treated nets (ITNs). The decreased use of  
190 ITNs suggests low prevention of malaria and hence higher risk of malaria infection. This gap  
191 in malaria **etiology has been reported by Aluh *et al* [4] and Udonwa *et al* [17]**. Furthermore,  
192 inadequate knowledge, misconceptions about the transmission, perception and management of  
193 malaria can adversely affect malaria control measures [4].

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

202 The treatment seeking behavior of the students showed that majority of the students (84.9%) go  
203 to the school clinic when they have a fever. This result indicates the satisfactory medical  
204 services given to the students at the school clinics to have such percentage of preference. Some  
205 of the students resort to self-medication where they prefer to buy drugs and take while very  
206 little number of students prefer to do nothing. This result is similar with the findings among  
207 boarding school students in Owerri, Imo State, Nigeria, that students self-medicated and  
208 readily obtained pharmaceuticals without prior medical consultation [7]. Also self-medication  
209 among secondary school students was reported in Akure, Ondo State [12]. This habit is not  
210 recommendable as these students may tend to take less than the recommended doses.

211

212

## 213 **CONCLUSION**

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

## 221 **RECOMMENDATIONS**

222 Promoting insecticide treated net (ITN) usage and use of mosquito repellent cream among  
223 boarding school students may help to achieve the desired protection against mosquito bites.

224 There is need to include school children in standard malaria interventions, which may alleviate  
225 the observed malaria burden. Also the use of ITN should be incorporated into school health  
226 policy as well as a school health policy against self-medication. All three tiers of Government  
227 needs to make ITNs available, affordable, and sustainable. There is also need to ensure  
228 efficient and effective distribution networks (to include boarding school students) for easy  
229 access of ITNs.

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

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

### 238 **Ethical Consideration and Consent**

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

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

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

250

251

### 252 **REFERENCES**

- 253 1. Abah, E. A. and Temple, B. (2015). Prevalence of Malaria Parasite among  
254 Asymptomatic Primary School Children in Angiama Community, Bayelsa State,  
255 Nigeria. *Tropical Medicine and Surgery*. 4(1):203-207.
- 256 2. Adepeju, I. S. (2017). Prevalence of Malaria Parasite among Asymptomatic and  
257 Symptomatic Students of Federal University of Technology, Akure, Ondo State. *British*  
258 *Journal of Research*. 4(1):5-10.
- 259 3. Aliyu, A. A. and Alti-Mu'azu, M. (2009). Insecticide-treated nets usage and malaria  
260 episodes among boarding students in Zaria, northern Nigeria. *Annals of African*  
261 *Medicine*. 8 (2): 85-89.
- 262 4. Aluh, D. O., Chigozie, G. A., Abdulmuminu, I. and Ezeme A. L. (2018). Knowledge  
263 and practice of malaria prevention and management among nonmedical students of



- 264 university of Nigeria, Nsukka. *International Journal of Community Medicine and*  
265 *Public Health*. (2):461-465.
- 266 5. Cheesborough M. (2005). *District laboratory practice in tropical countries, part 1* (2<sup>nd</sup>  
267 edition). Cambridge university press.
- 268 6. Cheesborough M. (2006). *District laboratory practice in tropical countries, part 2* (2<sup>nd</sup>  
269 edition). Cambridge university press.
- 270 7. Chukwuocha, U. M., Ashiegbu, K. K., Dozie I. N. S. and Aguwa, O. C. (2009). The  
271 perspectives of secondary school students on common diseases and medicines used:  
272 Implications for the implementation of school based health programmes in Nigeria.  
273 *Scientific Research and Essay*. 4 (11): 1403-1407.
- 274 8. Edogun, H. A., Daramola, G. O., Esan, C. O. and Edungbola, I. D. (2017). Prevalence  
275 of Malaria Parasitaemia in Three Selected Local Government Areas of Niger State,  
276 North Central, Nigeria. *Journal of Advances in Biology and Biotechnology*.16(3): 1-9.
- 277 9. Jacob, W. and Joao, P. (2012) *Training Manual on Malaria Entomology for*  
278 *Entomology and Vector Control Technicians (Basic Level)*. RTI International. United  
279 States Agency for International Development.
- 280 10. Musa B. (2005). Assessment of knowledge, attitude and practices on Malaria  
281 prevention among secondary school students of boarding schools in Morogoro District.  
282 *Dar Es Salaam Medical Students' Journal*. 15(1).
- 283 11. Musa Balowa (2006). Assessment of knowledge, attitude and practices on Malaria  
284 prevention among secondary school students of boarding schools in Morogoro District,  
285 September 2005. Tanzania Medical Students' Association (TAMSA).
- 286 12. Oluyemi, O. F. and Oluyemi, A. K. (2017). The study of the awareness, knowledge and  
287 perception of malaria among selected secondary school students in Akure metropolis,  
288 Nigeria. *The Open Public Health Journal*. 10(1):1-6.
- 289 13. Omudu, E. A. (2014). Poor, powerless and parasitized: the epidemiological triad in  
290 communities at the end of the road. Inaugural lecture series. No. 8. Benue State  
291 University, Makurdi. Selfers Academic Press Ltd.
- 292 14. Onah, P. O. (2018). Determinants of Malaria Treatment Seeking Behaviour among  
293 Urban and Rural Households in North Central Nigeria. *Journal of Advances in Medical*  
294 *and Pharmaceutical Sciences*. 16(1): 1-13.
- 295 15. President's Malaria Initiative, PMI, (2017). *Malaria Operational Plan FY 2017*.
- 296 16. Stella, K., Birgit, N., Fred, N., Charles, S. M., Joaniter, N., Juliet, N., Jorge, C.,  
297 Damaris, M., Rachel, L. P., Elizabeth, A., Katherine, E. H. and Simon, J. B. (2016).  
298 *Plasmodium falciparum* parasitaemia and clinical malaria among school children living  
299 in high transmission setting in western Kenya. *Malaria Journal*. 15:157.
- 300 17. Udonwa, N. E., Gyuse, A. N. and Etokidem, A. J. (2010). Malaria: knowledge and  
301 prevention practices among school adolescents in a coastal community in Calabar,  
302 Nigeria. *African Journal of Primary Health Care and Family Medicine*. 2(1): 103.
- 303 18. World Health Organization (2018). Malaria. Fact sheets.