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Factors Influencing Malaria Knowledge, Attitude and Practice in Gwagwalada

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ABSTRACT

Malaria epidemics are widespread in the tropics. Studies showed that malaria mitigation depends on case management, vector control and use of preventive measures. However, knowledge, attitude and practice (KAP) regarding malaria are paramount in the mitigation campaign which has not been given relevance in Sub-Sahara Africa. This study explores factors influencing KAP regarding malaria in Gwagwalada.

A cross-sectional survey was done in four different sites in Gwagwalada between March and September 2016. A structured validated questionnaire was used to obtain information from 384 respondents. There was a statistical comparison of the KAP among the different sites.

Majority of participants had heard about malaria (99.3%) but only 20% had good knowledge and 14.4% have good practice scores. There was no significant difference in the KAP scores of the four different sites examined. Of the selected socio-demographic predictors, occupation and education of participants were significantly different for attitude scores, while age and occupation were associated with knowledge scores. Only marital status was significant with good practice. The study found increased odds of good knowledge if the participants worked with the government (OR:1.34; .95CI:0.50,3.48) and decreased in odds of having good knowledge if the participants were older than 47 years (OR:0.98; 0.95CI:0.34,3.17). At multivariate level, only respondent's education significantly predicts attitude level ($P<0.05$) while age and occupation were independent predictors of level of knowledge.

Age and education are key determinant factors of malaria KAP in the study area. Therefore, health education should target people with lower education and older age at community level.

Keywords: Logistics Regression, Knowledge, Attitude, Practice, Malaria, Nigeria.

1 INTRODUCTION

Malaria is an important public health problem in the world with long time history. Malaria was on global scene over centuries even before the discovery of the malaria parasites and the mosquito as a vector around 1880. [(1)] The increased in folds of endemicity during the mid 1940s attracted global attention to malaria elimination in advanced nations. The global efforts in the eradication of malaria between 1955 and 1978 were successful with a sharp reduction in disease cases in most of the nations that adopted residual insecticides (dichloro-diphenyl-trichloroethane, DDT), [(2)] use of antimalarial drugs and active surveillance. [(3, 4)] Change of architectural designs of houses and clearing of vector breeding sites were adopted in addition to usage of insecticides in extinguishing malaria from the majority of the countries after the Second World War. [(5)] However, most nations in sub-Sahara Africa (SSA) were excluded from the global campaign; the exclusion prompted the spread and endemic nature of the disease in recent times. Lack of continuity in the campaign has left the cases on the increase in some part of the globe and especially in SSA as recent study revealed. [(6)] According to global statistics in 2015, malaria transmission is reported in

about 106 countries and territories with more than 200 million estimated cases with over 429,000 deaths. [7] About 90% of the estimated cases are in Africa, 7% in South-East Asia and 2% Eastern Mediterranean. Of the total estimated deaths in 2015, 92% occurred in Africa while 6% and 2 % deaths recorded in South-East Asia and Eastern Mediterranean respectively. [7] Despite the landmark achievement of the Roll Back Malaria 1998 and the Millennium development goals 2000 which left a significant reduction in number of cases, the malaria prevalence persists and thus constitutes a problem in SSA. [8] With the availability of vaccine for malaria treatment and control interventions, achieving the fourth World Health Organization (WHO) elimination continuum is still a mirage especially in tropics where the impact of climate change has favourably enhanced the breeding and transmission of malaria parasite. Thus, controlling the population of the mosquitoes that transmit the disease is crucial to sustainable disease prevention and control.

The spatial distribution of various strains of *Plasmodium spp* (especially the deadly *P. falciparum* in SSA), vectors and resistance to drugs has aided the persistence in the disease spread. [9] Also, lack of infrastructures and resources needed to mount aggressive elimination campaigns against the epidemic account for the number of cases reported. [10] The disease constitutes an economic burden in SSA with over billions of dollars spent annually. [11] North Africa nations are in the stage of prevention of reintroduction of the disease, [12] South Africa has about 1.4 cases per 1000 while SSA nations are still in control stage. [13] Pregnant women and children are the most vulnerable with 1 child die every thirty seconds. [14,15] The hospital record in Nigeria revealed over 60 percent of outpatient visits in Nigeria hospitals across all age groups are due to malaria. [16, 17] Malaria also contributes to 11 percent of maternal deaths and 30 percent of child deaths in Nigeria. [11,18]

The disease prevention and control at local levels depend not only on case management and treatment but also on the effectiveness of the levels of awareness and the knowledge of the disease symptoms, prevention and control practices. [19, 20] Studies on mosquito-borne diseases revealed more concentration and breeding of vectors around homes, construction sites, ponds and ditches. [21, 22] Hence, elimination of such rest heavily on community knowledge, attitude and practices (KAP) regarding the disease which studies identified as lacking at household levels. [23] This study examines and compares the KAP of the people residing in the four cardinal points of Gwagwalada area council (GAC) Abuja and to identify the factors influencing the KAP. Also, the study helps in design information and educating the community at household levels thereby bringing behavioural change in KAP regarding malaria which is desired for malaria reduction and control.

2 METHODS

2.1 Study area

The study was conducted in GAC, Abuja. GAC is one of the six area councils in Abuja with a total population of 158,618 inhabitants. [24] It is located on geographical coordinates $8^0 56' 21'' N$ and $7^0 04' 443'' E$ of the equator and Greenwich meridian respectively. [25] The climate of the study area is tropical: non-arid climate with only two seasons throughout the year: wet and dry. The mean temperature in the area ranges from $30°C - 37°C$ yearly with the highest temperature in the month of March and mean total annual rainfall of approximately 1,650mm per annum. [25]

2.2 Design of the study

The design of this study was based on descriptive cross-sectional study. The data were collected between months of March 2016 to September 2016 from individual who volunteers to participate in the survey. These months coincide with the rainy season which has been affirmed to be

the peak of malaria transmission and abundance of mosquitoes as reported in related study. [(19)]

2.3 Selection of samples and sample size

A total of 384 households make up the required sample size for the study. Four villages were selected randomly in GAC. Each of this selection was done based on the stratification of GAC into the four cardinal points. The study sites were Dobi, Ledi, Dagiri, and Tunga Maje (Figure 1). The Leslie Kish formula was used for sample size determination. [(26)]

2.4 Research instrument

The research instrument for the study was validated structured questionnaires. The questionnaires were divided into five different sections, covering basic socio-demographic information of respondents, source of information, knowledge on malaria infection, attitude towards malaria infection and its vectors and preventive practices against the diseases. Before the field work, the reliability of the questionnaire was tested on a micro scale on the pilot test and the questions adjusted appropriately to ensure internal consistency and avoid redundancy in the set of items included. This was achieved with the use of correlation Alpha for the various constructs of the instrument. The questionnaire was printed both in English and the most widely spoken local language (Hausa) in GAC. Field workers used were trained local university students who were fluent in both languages.

2.5 Ethical approval

The permission for the study was granted by FCT human ethical committee via the Executive Chairman and the Director Primary Health Care GAC, Abuja. Informed consent was also sought and obtained from the study participants before enrolment into the study.

2.6 Analysis of survey data

The data were entered into Excel spreadsheet. The data were scrutinized to correct the possible error during data entry and cleaning processes. The analysis was done with IBM SPSS statistics software package version 22.

A composite score rating system was used to assign values to KAP regarding malaria and categorized into two: good and poor based on the respondents' score on the three domain spanning disease KAP. For every correct answer, a score of 1 was given and 0 otherwise. The questions on KAP were scored accordingly and 75% was used as cut-off points for the two categories. The KAP levels of the four sampled districts were compared with Chi-square measures of association. The distribution assumptions of non-normality were checked with Kolmogorov Sirminov test for the KAP scores.

Logistic regression analysis was carried out to independently identify the key determinant of KAP-level of malaria. The three dependent variables established in the regression models are the KAP levels ('good' and 'poor') for the KAP while the residence, income, education, age, gender, occupation, and marital status were used as predictors for the logistic regression models. Only the significant variables at the bivariate level of association ($p<0.05$) with the response variable were considered for multivariate analysis. [(27)] Model variable eliminations were done using step-wise method to remove non-significant variables. Likelihood ratio test was used for model comparisons and Bayesian information criterion (BIC) used for the selection of the best candidate models. The model with the minimum value of BIC has the better fit to the data. We also checked for confounding variables among the independent variables as well as examined the predictors for multicollinearity.

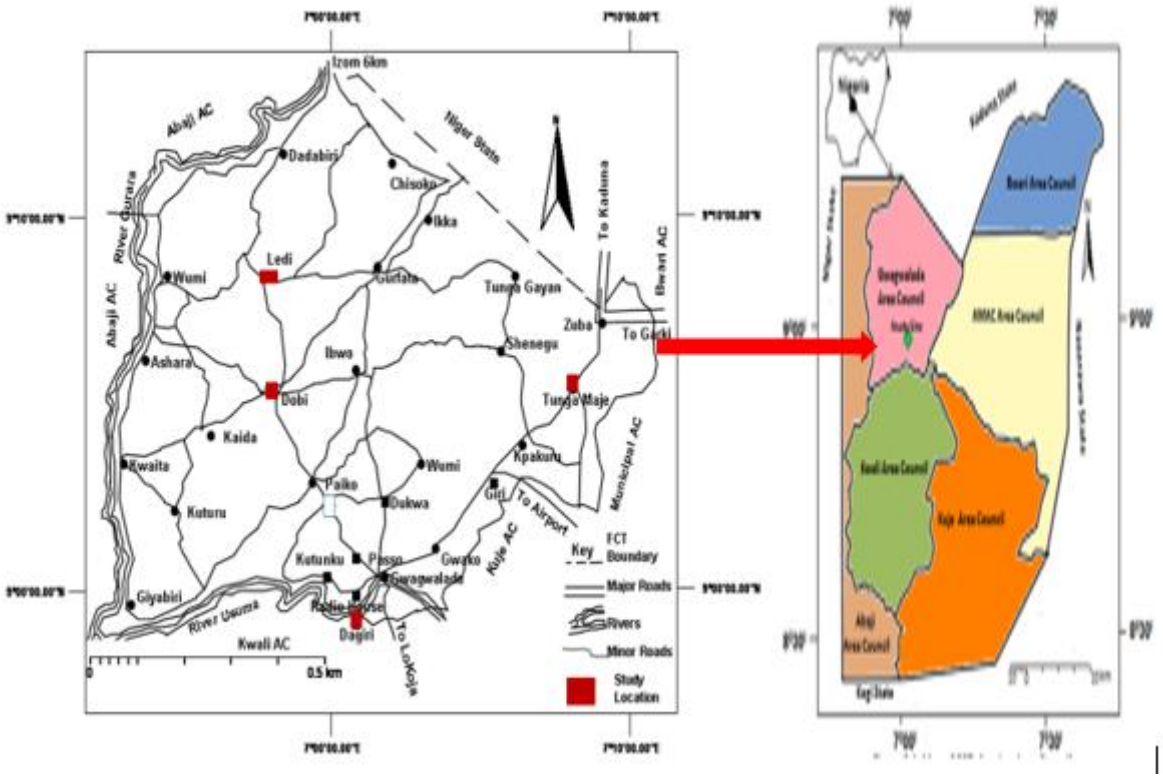

Figure 1. Map of Gwagwalada Area Council F.C.T. Abuja showing the study sites.

3 RESULTS

3.1 Socio-demographic characteristics of participants

Table 1 presents the socio-demographic characteristics of the participants. Of the total individuals targeted for enrolment into the study, 383 participants fully participated in the questionnaire KAP survey. The survey response rate was 96%. Out of total respondents, 58.9% were male while 41.1% were female. More than 60% of the participants are between the ages of 18 to 37 years while only about 7% were above 47 years. Most of the study individuals were educated, 67.5% had at least secondary education while 17% were illiterate. Only about 339 participants answered the question on the income, 57.2% of them had income less than $30.00 (about 6,000 Naira) per month as at the commencement of the survey. Socio-demographic characteristics examined were significantly different for the four study sites.

Table 1. Socio-demographic characteristics

Variables	Dobi n(%)	Ledi n(%)	Dagiri n(%)	T|Maje n(%)	Total(%)	P-value
Age group						<0.001
18-27	19(21.1)	54(52.9)	32(33.0)	30(32.3)	135(35.3)	
28-37	45(50.0)	15(14.7)	25(25.8)	37(39.8)	122(31.9)	
38-47	17(18.9)	20(19.6)	36(37.1)	16(17.2)	89(23.3)	
>47	9(10)	13(12.8)	4(4.1)	10(10.7)	36(9.5)	
Sex						<0.001
Female	36(37.5)	19(19.6)	58(59.8)	44(47.8)	157(41.1)	
Male	60(62.5)	78(80.4)	39(40.2)	48(52.2)	225(58.9)	
Education level						0.001
Illiterate	19(20.2)	33(33.7)	9(9.1)	4(4.3)	65(17.0)	
Elementary	13(13.8)	19(19.4)	14(14.1)	13(14.3)	59(15.5)	
Secondary	11(11.7)	41(41.8)	32(32.3)	40(44.0)	124(32.5)	
Tertiary	51(54.3)	5(5.1)	44(44.5)	34(37.4)	134(35)	
Monthly income						<0.001
i<$30	47(50.0)	63(77.8)	39(43.8)	45(60.0)	194(57.2)	
$30<i<$150	23(24.5)	15(18.5)	38(42.7)	20(26.7)	96(28.3)	
i>$150	24(25.5)	3(3.7)	12(13.5)	10(13.3)	49(14.5)	

All calculated p-values are estimated using chi-square measure of association for the four sites; $=U.S Dollars; $1 ≅ 200 Naira

3.2 Knowledge of symptoms and signs of malaria infection

A sizeable proportion of the participants heard of malaria before, only about 1% of the total 380 responded in the negative. There was no significant difference in the numbers that heard about malaria in the four sites. Meanwhile, there was a significant difference on the number of participants that have been diagnosed with the disease before (P-value <0.05) as over 77% responded in the affirmative to the question. A higher proportion of the participants were able to correctly identify fever, body weakness, high temperature as symptoms of malaria while only 1.4% answered do not know, with no significant difference between the study locations (Table 2).

3.3 Knowledge of malaria

Figure 2 reveals knowledge regarding disease transmission. About 4 out of every 5 respondents correctly identified mosquito bites while about 3% claim they do not know the means of transmission. Germs, eating bad food, dirty environment were identified by few individuals as means of malaria transmission.

3.4 Sources of information about malaria

The various sources of information on malaria by the study participants indicated that the larger percentage (41.1%) of respondents had suffered from the disease in the past while about 19% heard from the hospital. Only 16% of the total participants heard from radio and television while a marginal number 9 (1.5%) claimed to hear about the disease from the internet (Figure 3). However, the responses on the sources of malaria information in the various site were statistically significant (P<0.05). There were differences in response based on sources of malaria information.

Table 2. Knowledge on malaria infection

Variables	Dobi n(%)	Ledi n(%)	Dagiri n(%)	TMaje n(%)	Total (%)	P-value
Have you heard of malaria before?						0.552
No	1(1.1)	0(0.0)	0(0.0)	1(1.1)	2(.7)	
Yes	94(98.9)	97(100.0)	97(100.0)	90(98.9)	378(99.3)	
Have you been diagnosed with malaria infection before?						0.030
No	30(31.6)	23(23.7)	13(13.5)	20(22.2)	86(22.8)	
Yes	65(68.4)	74(76.7)	83(86.5)	70(77.8)	292(77.2)	
Has any member of your family had malaria fever in the last six months?						0.874
No	45(46.9)	49(51.6)	52(51.5)	43(47.8)	189(49.5)	
Yes	51(53.1)	46(48.4)	49(48.5)	47(52.2)	193(50.5)	
What are the symptoms of malaria?						** 0.770
Fever	39(35.5)	45(31.4)	43(25.7)	39(26.2)	166(29.2)	
High Temperature	20(18.2)	29(20.3)	46(27.6)	40(26.8)	135(23.7)	
Vomiting	15(13.6)	21(14.7)	27(16.2)	23(15.4)	86(15.1)	
Weakness	34(30.9)	41(28.7)	47(28.1)	43(28.9)	165(29.0)	
Donot know	1(0.9)	4(2.8)	1(0.6)	2(1.3)	8(1.4)	
Others	1(0.9)	3(2.1)	3(1.8)	2(1.3)	9(1.6)	

All calculated p-values are estimated using chi-square measure of association for the four sites; ** Individual ticked more than one options

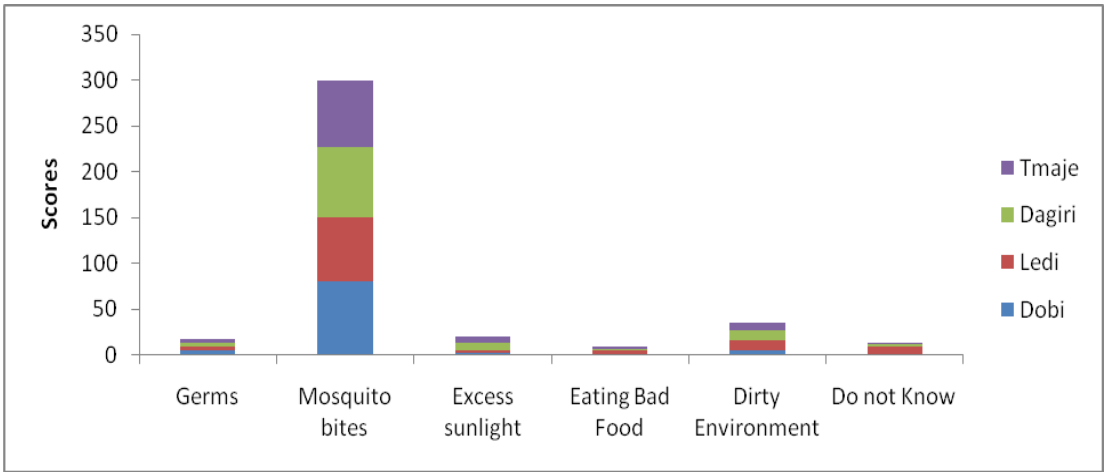

Figure 2. Knowledge of malaria transmission

3.5 Attitudes toward malaria infection

A sizeable number of individuals believed the disease can be prevented (96.0%), cured (95.5%), go to the hospital when infected (87.6%) and consult a doctor (83.9%). However, there are those that preferred to do nothing (1.9%), consult herbalist (4.2%) and prepare local herb (16.1%) when infected with malaria. The attitude of the participants in the four sites was significant (P<0.05) (Table 3).

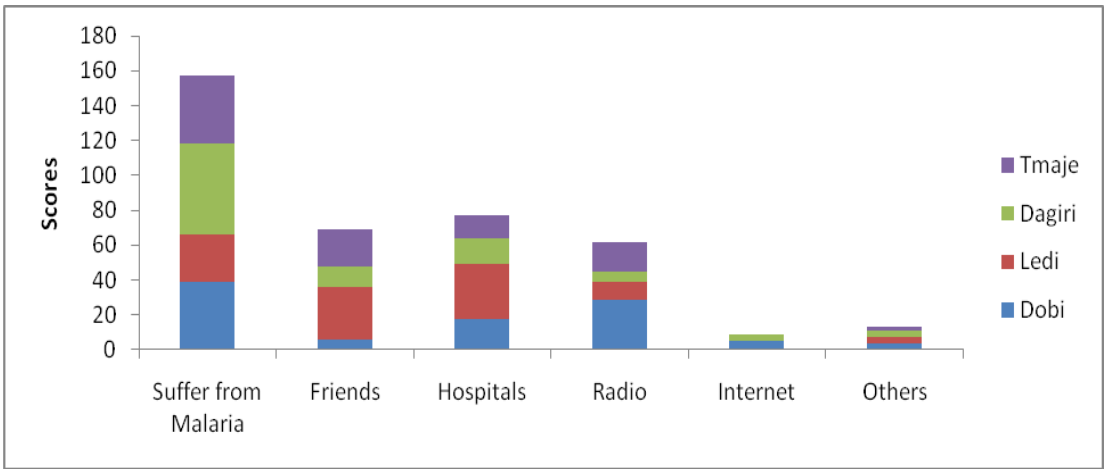

Figure 3. Source of information on malaria

Table 3. Attitude and practice regarding malaria

Variables	Dobi n(%)	Ledi n(%)	Dagiri n(%)	TMaje n(%)	Total (%)	P-value
Can malaria be cured?						0.599
No	5(5.3)	6(6.2)	4(4.4)	2(2.2)	17(4.5)	
Yes	90(94.7)	91(93.8)	87(95.6)	89(97.8)	357(95.5)	
What do you do if infected with malaria?						0.002
Go to hospital	89(93.6)	73(77.7)	84(85.7)	85(93.4)	331(87.6)	
Consult herbalist	1(1.1)	4(4.2)	9(9.2)	2(2.2)	16(4.2)	
Drinking herbs	3(3.2)	14(14.9)	4(4.1)	3(3.3)	24(6.3)	
Do nothing	2(2.1)	3(3.2)	1(1.0)	1(1.1)	7(1.9)	
Do you prefer to consult a doctor or prepare herbs?						0.011
Herb preparation	6(6.3)	19(20.0)	15(15.6)	19(23.5)	59(16.1)	
Consult a Doctor	89(93.7)	76(80.0)	81(84.4)	62(76.5)	308(83.9)	
Can malaria be prevented?						0.014
No	2(2.1)	9(6.3)	1(1.0)	3(3.3)	15(4.0)	
Yes	93(97.9)	86(93.7)	95(99.0)	87(96.7)	361(96.0)	

3.6 Preventive practices against malaria

Table 4 displays the preventive practices adopted by households. More than half (52%) ticked insecticide treated nets (ITNs) as the preferred option for household prevention methods while the use of smoke got the least scores (1%). The weekly sanitations were preferred by the majority of respondents in homes as a measure to reduce the breeding of mosquitoes. However, there were differences in prevention methods by study sites while sanitations were not statistically significant (p<0.05).

3.7 Correlation between KAP scores

The spearman correlation of the KAP scores was examined for the four sites (Table 5). The total KAP scores indicated positive correlation between K-A (r_s=0.47, 95% CI=0.39, 0.55, P<0.001), K-P (r_s=0.76, 95% CI=0.72, 0.80, P<0.001) and A-P (r_s=0.44 95% CI=(0..36,0.52 P<0.001). Although K-A coefficients were lower for Ledi and Dagiri (r_s<0.5), the coefficients were significantly higher for the other two sites (r_s>0.5). The K-P coefficients were comparable and high for all the participants in all the sites depicting strong correlation (r_s>0.9) between knowledge and practices regarding malaria. Likewise, A-P coefficients like K-P coefficients were

characterized by related positive coefficients and similar behaviour across study sites.

Table 4. Malaria prevention in homes

Variables	Dobi n(%)	Ledi n(%)	Dagiri n%	TMaje n(%)	Total (%)	P-value
What are prevention methods of malaria?						0.017
ITNs	50(44.2)	57(57.6)	61(59.8)	46(47.4)	214(52.0)	
IRS	27(23.9)	17(17.2)	18(17.7)	16(16.5)	78(19.0)	
WDNs	28(24.8)	10(10.1)	19(18.6)	29(29.9)	86(20.9)	
Coils	7(6.2)	9(9.1)	3(2.9)	3(3.1)	22(5.4)	
Smoke	0(0.0)	3(3.0)	0(0.0)	1(1.0)	4(1.0)	
Others	1(0.9)	3(3.0)	1(1.)	2(2.0)	7(1.7)	
How often do you clear vegetation around homes?						0.070
Weekly	60(63.8)	71(76.3)	62(66.0)	70(82.4)	263(72.5)	
Bi-weekly	18(19.1)	10(10.8)	17(18.1)	9(10.6)	54(15.0)	
Monthly	15(16.0)	7(7.5)	13(13.8)	5(5.9)	40(11.0)	
Yearly	1(1.1)	5(5.4)	2(2.1)	1(1.1)	9(2.5)	
How often do you clean your home and its surroundings?						0.698
Daily	81(86.2)	88(88.9)	80(84.2)	74(83.2)	320(85.6)	
Weekly	10(10.6)	6(6.1)	13(13.7)	11(12.4)	40(10.7)	
Monthly	2(2.1)	4(4.0)	2(2.1)	2(2.2)	10(2.7)	
Yearly	1(1.1)	1(1.0)	0(0.0)	2(2.2)	4(1.0)	

IRS: Indoor residual spray; WDNs: Window and door nets; ITNs: Insecticide treated nets

Table 5. Degree of relationships of domains of KAP scores

Var.	r_s(95%CI)					
	Dobi	Ledi	Dagiri	T|Maje	Overall	P-value
K-A	.67(.54,.76)	.36(.17,.52)	.45(.27,.60)	.72(.61,.81)	.47(.39,.55)	<0.001
K-P	.98(.97,.99)	.93(.89,.95)	.95(.93,.97)	.91(.85,.93)	.76(.72,.80)	<0.001
A-P	.68(.56,.78)	.37(.19,.53)	.49(.32,.64)	.85(.78,.90)	.44(.36,.52)	<0.001

K=Knowledge; A=Attitude; P=Practice; CI=Confidence intervals; $r_{s=}$ rank correlation coefficient (Spearman). Note: r to z Fisher's transformations employed for both CIs and P-values.

Table 6. Bivariate measures of association among hypothesized predictors of KAP

Variables	Class	Knowledge		Attitude		Practice	
		OR (0.95CI)	P-value	OR (0.95CI)	P-value	OR (0.95CI)	P-value
Age	18-27	1	0.007	1	0.453	1	0.813
	28-37	0.72 (0.35,1.46)		1.34 (0.69,2.62)		1.39 (0.67,2.96)	
	38-47	0.35 (0.18,0.68)		1.42 (0.73,2.77)		1.29 (0.63,2.70)	
	>47	0.98 (0.34,3.17)		1.97 (0.80,4.72)		1.25 (0.45,3.99)	
Marital Status	Single	1	0.491	1	0.794	1	0.026
	Widowed	1.32 (0.43,4.86)		1.39 (0.42,4.61)		2.48 (0.40,55.59)	
	Divorced	0.80 (0.31,2.22)		1.48 (0.47,3.85)		0.27 (0.10,0.76)	
	Married	1.41 (0.81,2.44)		1.29 (0.74,2.29)		0.63 (0.31,1.23)	
Education	Illiterate	1	0.418	1	0.020	1	0.223
	Element.	0.64 (0.28,1.49)		0.43 (0.13,1.29)		2.36 (0.71,9.12)	
	Second.	1.19 (0.54,2.56)		1.82 (0.88,3.92)		0.98 (0.41,2.25)	
	Tertiary	0.85 (0.40,1.78)		1.26 (0.59,2.75)		0.76 (0.32,1.69)	
Occupation	Not working	1	0.018	1	0.046	1	0.308
	Student	2.08 (0.69,6.36)		1.01 (0.76,3.69)		1.14 (0.36,3.44)	
	Self-employed	2.38 (0.95,5.73)		2.00 (0.76,6.15)		1,79 (0.65,4.55)	
	Private	0.81 (0.30,2.07)		1.12 (0.34,3.97)		1.51 (0.48,4.64)	
	Govt.	1.34 (0.50,3.48)		0.70(0.21,2.55)		2.99 (0.88,10.38)	

OR=Odds Ratio; CI=Confidence intervals

3.8 Causal relationship of socio-demographic variables on malaria KAP-level

Of the 380 participants that answered all questions relating to malaria KAP, 76 (20%) have good knowledge having scored a minimum of 75% on the knowledge score while 80% and 14.4% have a good attitude and good practices regarding malaria respectively. The measures of association revealed a significant association between KAP response domains and socio-demographic variables (Table 6). There were significant associations between disease knowledge, age and occupation of the participants ($p < 0.05$). The study found increased odds of good knowledge if the participants worked with government compared to those that were not working (OR:1.34; .95CI:0.50,3.48) and decreased in odds of having good knowledge if the participants were older than 47 years compared to18 to 27 years (OR:0.98; 0.95CI:(0.34,3.17). Likewise, the study found increased odds of having a good attitude if participant possessed tertiary education compared to illiterate (OR: 1.26; 0.95CI:0.59, 2.75). Sex, residence, and income were not significantly associated with KAP-levels and were not reported for brevity in Table 6.

Multivariate logistic regression models were fitted for KAP levels (Table 7). The fitted regressions were done based on the criteria that the response variables were associated with at least two predictors ($p<0.05$). The participants with elementary education level were more likely to have a good attitude than the illiterate (OR:2.28 0.95CI:0.75,6.96) while those with tertiary education were less likely to have a good attitude than the illiterate (OR:0.77;0.95 CI:0.35,1.65). Furthermore, the age group between 28-37 years (OR: 1.76; 0.95CI :0.85,3.66) and 38-47 years (OR:3.13; 0.95CI:1.60,6.12) were found to increase odds of having good knowledge compared to 18-27 years while the reverse is true for age group older than 47 years relative to reference group, 18-27 years (OR:0.94; 0.95CI:0.31,2.81). Also, the occupation of the participants was found to significantly predict malaria knowledge. Only those with private enterprise have increased odds of having good knowledge relative to those not working (OR: 1.36; 0.95CI:0.51, 3.62).

4 DISCUSSION

The present study suggests a good attitude of households' heads despites a generally low level of disease knowledge and practice regarding malaria prevention and control. The variations in KAP scores were not significantly different across the study sites. Low knowledge and poor practice suggest a high risk of malaria. This has been suggested in a related study in Kuje-Abuja, Nigeria. [(14)] Poor disease knowledge results in poor practices and hence the likelihood of an increase in disease cases in the community. This is consistent with KAP study in Ogun state, Nigeria. [(10)]

Most of the individuals interviewed identified fever, body weakness and high temperature as some of the symptoms of the disease while others claimed they do not know. Fever was the most commonly stated symptoms for malaria and other mosquito-borne diseases. [(21)] Those participants that claimed do not know and others that cannot identify the symptoms may be those that had not experienced the disease in recent time or those that were lucky to have non-severed cases in the past that were treated locally with herbs and believed the disease has gone. Some other participant confused the symptoms with another disease like typhoid fever. Lack of health awareness may occasion the low level of disease knowledge and level of education of the individuals in the community. [(10)]

The study revealed about 99% heard about malaria before, this may be due to the fact that they have individually suffered from it in the past. This was not significantly different across the study sites. A mosquito bite was the most identified means of transmission. This agrees with a related study. [(28)] Apart from being infected

in the past, participants' major sources of information were hospitals, radio/television, friends among others. This finding is similar to the one reported in Nigeria [(29)] and elsewhere on dengue fever. [(21)] The study found mass media (radio and television) as general sources of disease information.

The majority has a good attitude (80%). The findings may be due to the fact that some of the household members especially the children and pregnant women were infected severely in the past and as such, can possibly cause a change in attitude which was significantly different across the four sites.

There was a significant association between knowledge of the participant, their age group and occupation. The possible explanation may be experience goes with age, the more the age the more the experience of life phenomena while the nature of occupation affects the level of knowledge. Also, a significant relationship was observed between attitude and respondents' education and occupation. The attitude was positively associated with the level of education. The more the level of education, the more the attitudinal changes. The participants who were self-employed were two times more likely to have a good attitude than those that were not working. The study revealed marital status to be associated with prevention practices while other variables considered were not significant. These present results are inconsistent with earlier finding. [(30)] The study found a significant association between knowledge levels and participants' income and their level of education. The degree of relationship of knowledge and practices were high in the four sites. This suggests direct variations of the duo. Poor disease knowledge results in poor prevention practices around homes and hence the risk of high transmission, especially with the high-density human population. This is consistent with related KAP study. [(20, 21)] Also, study elsewhere revealed low knowledge and poor practices among respondents. [(30)] However, the authors found a positive attitude towards infection control measures. This outcome is congruent with the results of this study.

Table 7. Multivariate logistic regression for knowledge and attitude

Response variable	Predictor	Level	OR(0.95CI)	P-value
Knowledge	Age group	18-27	1	0.004
		28-37	1.76(0.85,3.66)	
		38-47	3.13(1.60,6.12)	
		>47	0.94(0.31,2.81)	
	Occupation	Not working	1	0.010
		Student	0.50(0.17,1.51)	
		Self-employed	0.30(0.16,0.96)	
		Private	1.36(0.51,3.62)	
		Govt.	0.79(0.29,2.10)	
Attitude	Education	Illiterate	1	0.041
		Element.	2.28(0.75,6.96)	
		Second.	0.56(0.26,1.19)	
		Tertiary	0.77(0.35,1.65)	
	Occupation	Not working	1	0.078
		Student	1.18(0.34,4.10)	
		Self-employed	0.56(0.20,1.59)	
		Private	0.97(0.29,3.19)	
		Govt.	1.56(0.46,5.29)	

OR=Odds Ratio; CI=Confidence intervals

The multivariate results revealed participants aged 28 to 37 years had a higher probability of good knowledge and those between 38 to 47 years had a significantly higher probability of good knowledge while those above 47 years were less likely to have good knowledge than the illiterate. This follows the intuitive reasoning, the chance of having malaria decreases with increasing age as more cases reported among children and those with lower immunity levels. [(31, 32)] Also, the occupation

of participants was a significant predictor of good knowledge. Education level was the only predictor identified at a multivariate level for good attitude. [(30)]

The results of this study are based only on the data generated with survey questionnaire in GAC. The interpretation has to be treated with caution as biased responses may be inevitable in the survey questionnaire. Also, sample size use may not be a true representation of the entire population in GAC though participants were sampled randomly to reduce such bias. However, the survey provides data on KAP, compares and finds main predictors of KAP levels in GAC.

In conclusion, the present study revealed low knowledge and poor practice among the participants. Age group and occupation significantly predict knowledge while only education as socio-demographic variable predict attitude.

Conflict of interest: None declared

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