

# Determination of knowledge, attitude, and practice of Chinese and local people toward malaria prevention in Kano State, Nigeria

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## Abstract

To date, malaria is still a major public health issue in the world. Africa remains the most affected continent with the highest number of malaria cases and deaths. Since more than one thousand Chinese citizens are living in Nigeria, an examination of their knowledge, attitude, and practice compared with those of the local people may be essential for malaria prevention. This study adopted cross-sectional research. A total of 137 Chinese people and 299 local people residing in Kano State, Nigeria constituted the study subjects. A questionnaire was used for the collection of data on

socio-demography and predictors of attitudes. The Cronbach alpha statistic was used to analyze these data. Insecticide spraying, mosquito repellents, and wearing protective clothing at night are the malaria preventive measures by both the local and Chinese people living in Kano state, Nigeria. However, there is a significant difference ( $P < 0.05$ ) between the two groups, with the duration of stay in Nigeria, the use of mosquitoes, attitude, and practices playing impactful roles among the Chinese people. Hence, Chinese people demonstrated better knowledge and control of malaria transmission and prevention than the local people living in Kano State. In conclusion, attitudes and practices toward malaria diseases are the major causes of the high rate of malaria in Nigeria, particularly in Kano State.

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Ethics approval and consent to participate: this study was approved by the Ministry of Health, Kano State, Nigeria as the study concerns the citizens and inhabitants of the state (MOH/Off/797/T.I/1830). For the consent to participate, an introductory letter was collected from Jiangnan University, China, and presented to the respondents of the research, i.e., the Chinese people community in Kano State and the citizens of Kano covered by the research for their consent. The ethical approval letter was presented before the commencement of the record extraction.

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## Introduction

Malaria is one of the most severe public health problems worldwide and a leading cause of death in many developing countries where young children and pregnant women are the groups most affected. In 2019, a global number of 229 million new cases of malaria and 409,000 deaths were reported, involving 87 countries and regions. Twenty-nine countries accounted for 95% of malaria cases globally Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%), and Niger (3%) accounted for about 51% of all cases.<sup>1</sup> In West Africa, Nigeria suffered 55% of malaria cases and accounts for 65% of hospital admission, 25% of infant mortality, 30% of childhood mortality, and some associated 11% of maternal deaths.<sup>2,3</sup>

Understanding who already knows about malaria and malaria prevention, who has adopted malaria prevention and mosquito avoidance practices, and who is at risk of malaria infection is a necessary precursor in identifying and targeting vulnerable populations and ensuring successful implementation and sustainability of malaria control efforts.<sup>4,5</sup> Studies on knowledge and attitude of people about the cause of malaria attack, its symptoms, transmission mode, and preventive measures across different geographical locations are beneficial to malaria control.<sup>6</sup> A comprehensive study of the malaria situation conducted across the six geographical zones of Nigeria revealed that malaria is a major cause of morbidity and mortality especially among vulnerable groups including women and children aged less than 5 years.<sup>6</sup> In the northwest of Nigeria, particularly Kano State with such a high prevalence of malaria, and high flow of foreigners especially the Chinese people, tends to give out a gap in public health intervention and concern towards the vaccination of the visitors, tourists, or foreign citizens on or before arrivals.<sup>6</sup> There is the scantiness of data on Knowledge, Attitude, and Practice (KAP) studies on malaria in northwestern Nigeria demonstrated that direct interaction with the community plays an important role in circumventing malaria spread.<sup>7</sup>

Despite the serious research studies on malaria burden in the

world, Africa and Nigeria in particular, there are cases of poor knowledge of malaria prevention, and management has been widely reported among people.<sup>8</sup> Thus, little effort has been placed into examining the knowledge of malaria transmission modes and the preventive Measures being utilized among Chinese and local people living in Kano State, Nigeria. With regards to the fact that Kano is a center of commerce and there is a high flow of foreigners into the State especially Chinese, there is an urgent need to examine the malaria knowledge and preventive measures being utilized among Chinese people and local people living in Kano State Nigeria. Therefore, the general aim was to examine the knowledge of malaria and preventive Measures among Chinese and local people living in Kano State, Nigeria. The study would be the creation of more public awareness and sensitization about malaria measures by alerting like-minded stakeholders such as the government at all levels, non-governmental organizations, corporate bodies, and individual people, *etc.*, an in-depth understanding of the level of malaria knowledge and its preventive measures among local and Chinese people living in Kano State, Nigeria.

## Materials and Methods

### Study area and population

The study was conducted in Kano State in the North-west geopolitical zone of Nigeria (Figure 1). It is made up of forty-four local government areas. Kano State has a rainy season that varies from year to year but normally stalls in May and ends in October of each year. Its dry season on the other hand starts from November to April each year. Inhabitants were mainly of Hausa ethnic nationality and predominantly professed the Islamic faith. The major economic activities of the state are agriculture, commerce, manufacturing, mining, banking and insurance, tourism, and recreational services. Kano state has a high malaria transmission rate all year round because of its population rate and the weather. The study population was Chinese residing in Kano State and local people in Kano State, Nigeria who consented and agreed to participate in the study voluntarily and were informed to leave the study whenever they felt like that.

### Study design

This study is a cross-sectional study design which allows direct observation by the researcher of the phenomena to be investigated and makes information collection swift in a short time (in public health the use of collective effort is very frequent), without the need for follow-up of the participants, and to produce faster results, thus, at a lower cost than other designs.<sup>9</sup> Sample size calculation was done using 95% confidence interval and 0.02 precision and prevalence rates. The sample size of the study was determined using the formula:

$$n = \frac{t^2 P(q)}{d^2}$$

$$\frac{(1.96)^2 (.61) (.39)}{(0.05)^2}$$

where: t = value for a selected alpha level of .025 in each tail = 1.96. (The alpha level of 0.05 indicates the level of risk the researcher is willing to take that the true margin of error may exceed the acceptable margin of error).

(P)=60.1% of a study in 2016 on malaria knowledge in Kano revealed that the prevalence of malaria infection was 60.6% (334/551).<sup>10</sup>

(q)=(1-P), n=desired calculated sample size, d<sup>2</sup>=Minimum allowed error 0.05%, n= 366 as calculated sample size.<sup>11</sup> Therefore, the total 366 sample size of the sample population was Chinese people residing in Kano State and local people in Kano State Nigeria, and information on KAP was collected during the study period.

### Validity and reliability

To ascertain the validity of the questionnaire for the study, face and content validity was used for this study. The copies of the questionnaire were given to three experts in the Department of Public Health and Preventive Medicine, School of Medicine Jiangnan University, China to examine their clarity, appropriate-

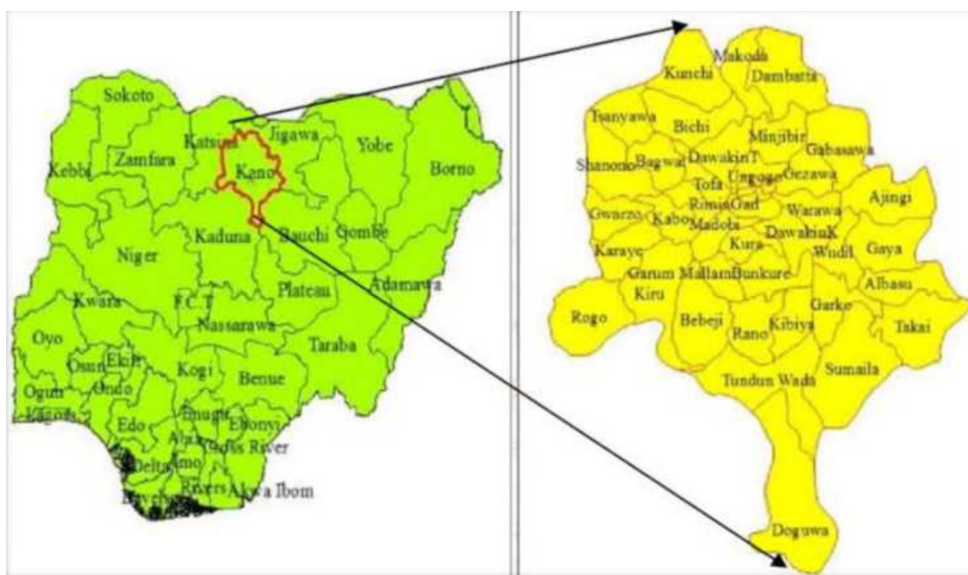


Figure 1. Map of Nigeria showing Kano State, the study area.

ness and ensure that all contents are in line with the research questions. A trial test was conducted to determine the reliability of the questionnaire for this study. Fifty respondents were sampled from Jigawa State, Nigeria, for trial testing outside the sample selected for the study. The questionnaire was administered to the respondents concurrently. The Cronbach alpha statistic was used to analyze the data obtained for the trial testing of the questionnaire and reliability coefficients of 0.66 and 0.78 were obtained for knowledge of malaria and awareness of malaria preventive measures, respectively. This was considered adequate for the study. These reliability coefficients indicate that the questionnaire used was adequate and consistent for the study.

### Collection of data

Permission was sought from the participants involved in this study. A two-day training was conducted for the research assistants on the administration and collection of data from the respondents using the questionnaire. Afterward, the research assistants were deployed to their respective areas with the questionnaire. The respondents were adequately instructed on how to respond to the questionnaire of the study. The researchers and trained assistants monitored the completion and collected the answered questionnaires directly from the respondents. The method of distribution of the questionnaire was done by direct delivery which ensures a 100% return rate. The collection of data lasted for four weeks. After the collection of the questionnaires from the respondents, the researchers coded the data (responses) and scored them accordingly.

### Data analysis

Data were analyzed using descriptive and inferential statistics.<sup>12</sup> The descriptive statistics of percentage count, mean and standard deviation were used to answer the research questions one to two. Cross-tabulation and bivariate analysis were used to test the null hypothesis. All analysis was done using Statistical Package for Social Sciences version 23. All the null hypotheses were tested at alpha level 0.05. The decision rule is as follows: if  $P < 0.05$ , reject the null hypothesis otherwise do not reject if  $P > 0.05$ .

## Results

### Attitudes and practices of malaria prevention

The socio-demographic characteristics of the study respondents are presented in Table 1 with the age categorized. The minimum age of the respondents is 18 years in both two groups of respondents, with a mean of 31 years in local people and 39.3 years in Chinese people respectively with a standard deviation of 10.8 in local people and 6.2 in Chinese people. The majority of the respondents were between the age ranges of 18-32 years (61.1%) among local people and 33-47 years among Chinese people respectively. Males constitute 144 (62.9%) among local people and 97 (70.8%) among Chinese people while 37.1% were females in local people and 29.2% were females in Chinese people respectively. The majority of the Chinese respondents 102 (74.5%) were living in Nigeria for 6-10 years, 28 (20.4%) among them were living in Kano state for 11-15 years while only 7 (5.1%) among them were living for 1-5 years. The majority of the respondents among local people 115 (50.2%) were single with 95 (41.5%) married, contrary to that of Chinese people, the majority among them 68 (49.6%) were married with 65 (47.4%) being single.

Since the research was conducted in the Kano metropolis and predominantly the people living in the state were Muslims, the majority of the local respondents 203 (88.6%) were practicing the Islamic faith with only 26 (11.4%) among them being Christians.

Among the Chinese respondents, 61 (44.5%) of them were Christians while the majority of them were practicing Catholicism, Buddhism and Taoism as their religious faiths. The majority of the respondents from local areas 98 (42.8%) attended tertiary level of education, and also 130 (94.9%) were Chinese respondents. Only 22 (9.6%) of the local respondents attended Qur'anic education. The majority of the respondents 98 (71.5%) Chinese people were engaging in businesses and trading as their occupation and 30 (21.9%) among them were contractors, but contrary to local people as 92 (40.2%) were students and 56 (24.5%) were business and trading respectively. The majority of the respondents 177 (77.3%) local people were Hausa by tribe, while 22.6% were Hui by tribe among Chinese respondents, 23 (16.8%) were Zhuang and Miao, and 28 (20.4%) were Yao, 19 (13.9%) were Tujia and 13 (9.5%) were Uyghur respectively. The majority of the Chinese respondents (134 (97.8%)) practiced monogamy type of family, and 83.9% of them has a 1-2 family size, contrary to local respondents where the majority of them 124 (54.1%) practiced polygamy family setting and 48.5% have 5-6 family size respectively.

### Predictors of knowledge of malaria among local people (Nigerians) and the Chinese

A multivariate analysis shows that wearing protective clothes and attitudes and practices were found to remain independent predictors of knowledge of malaria among local respondents (Table 2). Males among the local respondent are 0.2 times more likely to have good knowledge of malaria ( $P=0.03$ ,  $AOR=0.29$ , 95%  $CI=1.03-3.24$ ). Also, local respondents wearing protective clothes at night are 0.3 times less likely to have good knowledge of malaria ( $P=0.01$ ,  $AOR=0.30$ , 95%  $CI=0.25-0.81$ ). Again, local respondents with good attitudes and practices are 0.3 times more likely to have good knowledge of malaria ( $P=0.01$ ,  $AOR=0.29$ , 95%  $CI=1.19-3.75$ ). Comparatively, the multivariate analysis for the Chinese on other covariates: years being in Nigeria; mosquito repellents, and attitude and practices were found to remain independent predictors of knowledge of malaria among Chinese respondents. Spending years in Nigeria, the Chinese respondents living in Kano are 0.4 times more likely to have good knowledge of malaria ( $P=0.01$ ,  $AOR=0.38$ , 95%  $CI=1.16-5.25$ ). Also, using mosquito repellents among Chinese respondents shows that they are 0.7 times more likely to have good knowledge of malaria ( $P=0.04$ ,  $AOR=0.72$ , 95%  $CI=1.02-17.69$ ). Again, Chinese respondents with good attitudes and practice are 0.4 times more likely to have good knowledge of malaria ( $P=0.02$ ,  $AOR=0.44$ , 95%  $CI=1.68-9.77$ ).

### Predictors of attitudes and practices to malaria among local people (Nigerians) and the Chinese

From the study survey, age, family type, use of malaria prophylactic drugs during pregnancy, and knowledge of malaria were found to remain independent predictors of attitude and practice towards malaria prevention among local respondents. People of age among local respondents are 0.4 times more likely to have a good attitude and practice toward malaria prevention ( $P=0.02$ ,  $AOR=0.38$ , 95%  $CI=1.16-5.31$ ). Also, the type of family among local respondents is 0.3 times less likely to have a good attitude and practices towards malaria prevention ( $P=0.04$ ,  $AOR=0.31$ , 95%  $CI=0.29-0.99$ ). The use of malaria prophylactic drugs during pregnancy among local respondents shows that they are 0.3 times more likely to have a good attitude and practice toward malaria preventive measures ( $P=0.01$ ,  $AOR=0.33$ , 95%  $CI=0.23-0.87$ ). Also, local respondents with good knowledge of malaria are 0.3 times more likely to have a good attitude and practice toward malaria prevention and control ( $P=0.01$ ,  $AOR=0.30$ , 95%  $CI$

**Table 1. Socio-demographic characteristics.**

Variables	Local people n=229 (%)	Chinese people n=137 (%)
Gender		
Male	144 (62.9)	97 (70.8)
Female	85 (37.1)	40 (29.2)
How long in Nigeria		
1-5	-	7 (5.1)
6-10	-	102 (74.5)
11-15	-	28 (20.4)
Mean $\pm$ SD	-	8.9 $\pm$ 2.3
Age group		
18-32	140 (61.1)	20 (14.6)
33 -47	67 (29.3)	97 (70.8)
>47	22 (9.6)	20 (14.6)
Mean $\pm$ SD	31.0 $\pm$ 10.8	39.3 $\pm$ 6.2
Marital status		
Married	95 (41.5)	68 (49.6)
Single	115 (50.2)	65 (47.4)
Others	19 (8.3)	4 (2.9)
Religion		
Islam	203 (88.6)	0 (0.0)
Christianity	26 (11.4)	61 (44.5)
*Other religion (Catholicism, Buddhism and Taoism)	0 (0.0)	76 (55.5)
Level of education		
Qur'anic	22 (9.6)	0 (0.0)
Primary	16 (7.0)	0 (0.0)
Secondary	93 (40.6)	7 (5.1)
Tertiary	98 (42.8)	130 (94.9)
Occupation		
Civil servant	22 (9.6)	0 (0.0)
Business/trading	56 (24.5)	98 (71.5)
Artisan	21 (9.2)	0 (0.0)
Housewife	28 (12.2)	9 (6.6)
Farming	10 (4.4)	0 (0.0)
Student	92 (40.2)	0 (0.0)
Contractor	0 (0.0)	30 (21.9)
Ethnicity		
Hausa	177 (77.3)	0 (0.0)
Yoruba	16 (7.0)	0 (0.0)
Igbo	21 (9.2)	0 (0.0)
Ebira	7 (3.1)	0 (0.0)
Kanuri	5 (2.2)	0 (0.0)
Babur	3 (1.3)	0 (0.0)
Zhuang	0 (0.0)	23 (16.8)
Miao	0 (0.0)	23 (16.8)
Hui	0 (0.0)	31 (22.6)
Yao	0 (0.0)	28 (20.4)
Tujia	0 (0.0)	19 (13.9)
Uyghur	0 (0.0)	13 (9.5)
Family type		
Monogamy	105 (45.9)	134 (97.8)
Polygamy	124 (54.1)	3 (2.2)
Family size		
1-3	55 (24.0)	115 (83.9)
>4	63 (27.5)	22 (16.1)

**Table 2. Univariate and multivariate logistic regression for knowledge of malaria.**

Characteristics	Univariate analysis			Multivariate analysis		
	OR	95% CI	P value	OR	95% CI	P value
Training cohort (n = 176)						
Age	0.990	0.974-1.006	0.536	1.021	0.958-1.088	0.521
Histology	1.409	1.006-1.975	0.309	0.601	0.182-1.983	0.403
Stage	108.375	56.458-208.035	6.70E-13	129.981	30.308-557.442	5.65E-11
Gender	1.219	0.872-1.704	0.555	0.811	0.251-2.621	0.726
Radiation	5.398	2.476-11.768	0.031			
Signature (High vs. Low risk)	9.186	6.088-13.861	7.01E-08	11.571	3.278-40.848	0.0001



=1.21-4.08) (Table 3). On the part of the Chinese respondents, it was gathered from the survey that years being in Nigeria, ethnicity, use of mosquito repellents, and knowledge of malaria were found to remain independent predictors of attitude and practice towards malaria prevention among Chinese respondents living in Kano. Years being in Nigeria among Chinese respondents shows that they are 0.4 times more likely to have a good attitude and practice toward malaria prevention ( $P=0.03$ ,  $AOR=0.41$ ,  $95\% \text{ CI}=1.05-5.42$ ). Also, ethnicity among the respondents determines that they

are 0.7 times more likely to have good attitudes and practices towards malaria prevention ( $P=0.01$ ,  $AOR=0.77$ ,  $95\% \text{ CI}=3.82-80.47$ ). The use of mosquito repellents among Chinese respondents shows they are 0.8 times more likely to have a good attitude and practice towards malaria preventive measures ( $P=0.01$ ,  $AOR=0.84$ ,  $95\% \text{ CI}=7.04-190.92$ ). Also, Chinese respondents with good knowledge of malaria are 0.5 times more likely to have a good attitude and practice toward malaria prevention and control ( $P=0.02$ ,  $AOR=0.51$ ,  $95\% \text{ CI}=1.15-8.58$ ) (Table 4).

**Table 3. Predictors of attitudes and practices to malaria among local people (Nigerians).**

Variables	Attitudes and practices (%)	OR	95% CI	P
Country				
Local people	229 (62.6)	0.34	(0.21-0.55)	*0.000
Chinese people	137 (37.4)			
Age				
<30	120 (52.4)	0.38	(1.16-5.31)	*0.002
≥30	109 (47.6)			
Marital status				
Married	95 (41.5)	0.39	(0.76-3.60)	0.201
Non married	134 (58.5)			
Occupation				
Employed	22 (9.6)	0.59	(0.16-1.62)	0.252
Non employed	207 (90.4)			
Family type				
Monogamy	105 (45.9)	0.31	(0.29-0.99)	*0.004
Polygamy	124 (54.1)			
Insecticide treated net				
Yes	189 (82.5)	0.41	(0.21-1.09)	0.086
No	40 (17.5)			
Prophylactic drugs				
Yes	140 (61.1)	0.33	(0.23-0.87)	*0.001
No	89 (38.9)			
Protective clothes				
Yes	147 (64.2)	0.32	(0.30-0.1.08)	0.082
No	82 (35.8)			
Knowledge of malaria				
Good knowledge	120 (52.4)	0.30	(1.21-4.08)	*0.001
Poor knowledge	109 (47.6)			

\*Statistically significant.

**Table 4. Predictors of attitude and practices to malaria among Chinese people living in Kano state.**

Variables	Attitudes and practices (%)	OR	95% CI	P
Years in Nigeria				
≤7 years	40 (29.2)	0.41	(1.05-5.42)	*0.003
>7 years	97 (70.8)			
Marital status				
Married	68 (49.6)	0.53	(0.23-1.84)	0.423
Non married	69 (50.4)			
Ethnicity				
Zhuang, Mio & Hui	77 (56.2)	0.77	(3.82-80.47)	*0.001
Yao, Tujia & Uyghur	60 (43.8)			
Protective clothes				
Yes	87 (63.5)	0.55	(0.52-4.50)	0.436
No	0 (36.5)			
Mosquito repellents				
Yes	81 (59.1)	0.84	(7.04-190.92)	*0.001
No	56 (40.9)			
Knowledge of malaria				
Good knowledge	51 (37.2)	0.51	(1.15-8.58)	*0.002
Poor knowledge	86 (62.8)			

\*Statistically significant.

## Discussion

The findings showed that knowledge of malaria among local and Chinese people in Kano state was found to be statistically significantly associated with gender among local people, years in Nigeria, and religion among Chinese people. Who had about appropriate knowledge of malaria by stating that it could kill if it is not treated. It was agreed that people knew that delay in treatment-seeking as well as inadequate treatment of malaria can lead to death or sequels.<sup>16</sup>

Socio-demographic factors with knowledge of malaria among local and Chinese people in Kano state were found to be statistically significantly associated with gender among local people, years in Nigeria, and religion among Chinese people. The findings also concurred with those who found a significant difference between males and females in malaria transmission knowledge.<sup>16</sup> There was a significant difference between males and females in correct knowledge to prevent malaria. More females reported using ITNs as compared to men. Symptoms of malaria such as intermittent fever and headache, fever/high body temperature and general body weakness, and fever with rigors were most frequently mentioned. Other symptoms mentioned were dizziness, abdominal pain, loss of appetite, diarrhea, body pains, and cramps. Also, the research stated the association between the respondents' knowledge and attitudes about malaria and their age, gender, educational status, and household monthly income.<sup>12</sup> The results showed significantly higher levels of knowledge of malaria symptoms, particularly weakness, vomiting, and abdominal pain among adult respondents than among children. While the findings disagreed with those who observed no significant difference in the malaria prevention practices between urban and rural areas except for taking fansidar.<sup>17</sup> The findings showed no significant difference between educational status and malaria preventive practices.<sup>18</sup>

Insecticide-treated net (ITN) and use of malaria prophylactic drugs during pregnancy, wearing protective clothes at night, mosquito repellents, and knowledge of malaria transmission were found to be significantly associated with attitude and practice of malaria preventive measures among local and Chinese people in Nigeria. The findings corroborate that malaria can be prevented including reducing exposure to mosquitoes by the use of ITN and indoor residual spraying as a way of bite prevention, spraying the home with insecticides to help kill mosquitoes that find their way in, keeping a clean environment by ensuring bush in surroundings are cleared and drainages cleaned up, use of preventative drugs, and health education, sleeping under a mosquito net and sleeping under respectively.<sup>15,16</sup> It was agreed that practice on malaria was found to be significantly associated with one's attitude.<sup>17</sup> Those having a positive attitude regarding susceptibility, seriousness, threat or consequences, treatment, prevention, and control of malaria were about 5 times more likely to practice well when compared to the ones having a negative attitude.

A study showed that unsafe water supply, sanitation, and hygiene are responsible for typhoid and malaria fever in Nigeria and in most cases affect the health of poor people.<sup>16,17</sup> The majority of women (85.2%) knew that mosquito bites could cause malaria. In another finding, the knowledge of respondents about malaria shows that the great majority 178/200 (89%) have heard about malaria and knew that malaria is transmitted through mosquito bites. Filthy surroundings of households along with puddles or places where polluted and contaminated water can accumulate were some other causes quoted by a majority of the participants.<sup>17</sup> The respondents were well informed about malaria; 483 (95.6 %) knew about malaria (excluding children less than 10 years). All research participants that had heard about malaria demonstrated

appropriate knowledge of malaria by stating that it could kill if it is not treated.<sup>9</sup> Although participants also identified loss of appetite and energy, dizziness, and body pain the numbers were not convincing. A small proportion of the respondents included diarrhea and cramps as other signs and symptoms of malaria. Fever, headache, chills, sweating, and malaise are the most common signs and symptoms of malaria.<sup>16</sup> Malaria is transmitted through mosquito bites. Analysis by age showed that the level of knowledge about malaria transmission varies between different age ranges, being the highest in people  $\geq 41$  years old.<sup>15</sup>

The study shows a significant difference between males and females in malaria transmission knowledge ( $P < .03$ ). A significant association between education level and knowledge of malaria transmission was also observed ( $P < .001$ ). Only 3.7% (4/106) of illiterate people associated malaria transmission with the bites of mosquitoes which have fed on malaria patients, as compared to 22.8% (59/259) of literate people. Stagnant water was mentioned by almost 2/3 of respondents to be the main area for mosquito breeding. A significant relationship between education level and correct knowledge of mosquito breeding areas was observed ( $P < .001$ ). The major source of information about malaria was the individuals' experiences with the disease.<sup>9</sup> Educational level was found to have a significant association with an individual's knowledge of malaria. In this regard, study participants with the educational level of college and above were 6 times more likely to have good knowledge of malaria as compared to their illiterate counterparts (AOR (95% C.I) = 6.377(2.525, 16.109)) ( $P < .001$ ).<sup>17</sup> According to Adongo and Kirkwood (2005), most of the women (97.4%) and over 80% of the women reported that sleeping under a mosquito net and sleeping under an insecticide-treated net respectively, are the best practices to prevent malaria. Furthermore, a very low proportion of the women opined that: using insecticide sprays, creams, and lotions (6.1%), taking preventative medications (6.4%), insecticide coils (4.5%), and drinking plant juice/root (5.9%), coil smoke (4.9%) and covering the body (8.7%) were the best preventive measures. About one-fifth reported that keeping the surroundings clean is the best preventive measure.<sup>9</sup> The students were rated as having average knowledge about the prevention of malaria and the practice of disease prevention.<sup>7</sup> Although participants also identified loss of appetite and energy, dizziness, and body pains<sup>15</sup> Study participants' attitude was found to be significantly associated with their knowledge of malaria. Those who had good knowledge of malaria were 3 times more likely to have a positive attitude towards malaria when compared to the ones having poor knowledge.

## Conclusions

Chinese people living in Kano state showed more knowledge of malaria transmission than local people living in the state. Insecticide spraying, mosquito repellents, wearing protective clothes at night, and attitude and practice are the malaria preventive measures used by both local people and Chinese people living in Kano State, Nigeria. Gender, wearing protective clothes, attitudes, and practices were statistically significant predictors of knowledge of malaria among local respondents, except ITN. During periods of stay in Nigeria, the use of mosquito repellents and attitude and practices were found to be significant, while religion and protective clothes were not significant in predicting knowledge of malaria among Chinese respondents. Age, family type, use of malaria prophylactic drugs during pregnancy, and knowledge of malaria predicted attitudes and practices towards malaria prevention among local respondents, while marital status and occupation were not sig-

nificant in predicting attitudes and practices towards malaria among local people in Nigeria. Finally, in the period of stay in Nigeria, ethnicity and the use of mosquito repellent were found to be significant in predicting attitudes and practices towards malaria prevention among Chinese respondents living in Kano state.

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