



## **Malaria Infection, Knowledge, Attitude and Practice of Persons Patronising Drugstores for Malaria Treatment in Port Harcourt, Rivers State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

**Objectives:** The study aimed to assess Malaria infection, Knowledge, Attitude and Practice (KAP) on malaria of persons patronising drugstores for malaria treatment in Port Harcourt and its environs in Rivers State, Nigeria.

**Methods:** Whole blood samples were collected from 663 participants by venepuncture from 24 randomly selected drugstores at three different locations and were analysed using established practice. Also, a semi structured questionnaire was also administered to obtain socio-demographic characteristics and the participants' Knowledge, Attitude and practice (KAP) on malaria.

**Results:** Out of the 663 participants, 151 (22.8%) were positive for malaria. The occurrence of malaria in the study areas were Mile 4 (Rumueme) 30.8%, Rumuosi 23.1% and D/line 14.5% which was significantly different ( $P = 0.001$ ). More persons 458 (69.1%) between the ages of 25years and above participated in the study. Also, more males 357 (53.9%) than females 306 (46.2%) participated in the study. In all, 98.5% were aware of what malaria is and 89.4% knew that mosquito bite was responsible for malaria. On the whole, 97.1% of the respondents had a good

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knowledge of malaria. Overall, 97.7% of the participants showed a good attitude regarding malaria. Approximately 84% of the participants had poor practice about malaria.

**Conclusion:** Malaria infection rate, Knowledge of and attitude to malaria were high but the practice was low in the study area. There is need to intensify efforts towards education of the people on the necessity of compliance to good practice as that is the only way the war on malaria control can be effectively won.

*Keywords: Malaria infection; knowledge; attitude; practice; treatment; drugstores.*

## 1. INTRODUCTION

Malaria remains a public health problem in the tropical and subtropical regions of the world because favourable climate and the right environmental factors which favour the breeding of mosquitoes and invariably increase the transmission of the malaria parasite abound [1]. It has caused much pain and untimely death in tropical and sub-tropical countries [2].

According to the WHO report of 2015, 90% of malaria incidence is found in sub-Saharan Africa. Nigeria, Uganda, Tanzania, Ethiopia and the Democratic Republic of Congo top the list. These countries record 47% of all malaria cases and 50% of deaths due to malaria worldwide [3]. In Nigeria, malaria is a common disease, a major public health challenge [4] and an infection that is responsible for a significant reduction in economic output [5].

Patronage of drug sellers is a very common practice in Nigeria across every socioeconomic stratum. Medicine sellers in Nigeria are reported to be very important in the treatment of uncomplicated malaria [6]. This occurs even when their knowledge is poor when compared to other professional health care officers. Medicine sellers can be found in general stores, drug stores, kiosks and market stalls [7]. They are preferred even when more convenient and less expensive alternatives exist, such as village health workers [8]. The levels of education vary across medicine sellers. They do not give professional consultation [7]. Majority of them have little or no formal training in pharmacy or medicine. Some drug store staff may be trained or untrained as medical assistants or as nurses [9].

Although, there are reports that majority of the people taking antimalarial reside in rural areas of the world [10], many urban dwellers suffer from malaria and patronise drugstores. Nigerian knowledge, attitude and practice (KAP) studies relating to malaria have been conducted mainly

in rural communities [11]. In most malaria endemic areas KAP studies have not received much interest, often overlooked [12,13], providing fertile grounds for the issue of prevention and control of the disease to rage on over the years. For the achievement of the Sustainable Development Goals (SDGs) on malaria which is to reduce the incidence and death due to malaria world wide by 90% by the year 2030, there is an urgent need to have a holistic view in this regard. This study was to assess malaria infection, Knowledge, Attitude and Practice of persons patronising drugstores for malaria treatment in Port Harcourt, Rivers State, Nigeria.

## 2. MATERIALS AND METHODS

### 2.1 Ethical Considerations

Ethical clearance was obtained (UPH/CEREMAD/REC/04) from the Research Ethics committee of the University of Port Harcourt in accordance to the declaration of Helsinki for procedures involving human subjects. A written consent was obtained from owners of drugstores, and written consent sort and obtained from participating individuals.

### 2.2 Study Population

The participants were consenting individuals reporting to participating drugstores and requesting for antimalarial for treatment of perceived malaria for themselves.

#### 2.2.1 Eligibility criteria

Eligibility for the study was based on both inclusion and Exclusion criteria.

#### 2.2.2 Inclusion criteria

\*Persons who purchased antimalarial to treat perceived malaria for themselves from participating drugstores in the study area and

who gave inform consent to participate in the study.

### 2.2.3 Exclusion criteria

\*Persons who purchased antimalarial for malaria treatment for others not present.

\*Persons who purchased antimalarial for malaria treatment for themselves from participating drugstores but not resident in the study area.

\*Persons who purchased antimalarial from participating drugstores but not willing to give consent.

## 2.3 Sample Size Determination

The sample size was 663.221 per cluster. It was determined using the formula by Gaur [14].

$$n \times D + 5\%(n)$$

Where

n = the minimum sample size

$$n = Z^2PQ / e^2$$

z = the standard normal deviation corresponding to the level of significance = 1.96

p = estimated prevalence = 30%

q = (1-p)

e = level of precision of error estimated at 95% confidence level = 0.05.

D = designed effect = 2

5% (n) = for reliability or non-response (attrition rate)

$$n = \frac{(1.96)^2 (0.3) (1-0.3)}{(0.05)^2}$$

$$n = \frac{1.96^2 \times 0.3 \times 0.7}{0.0025}$$

$$n = \frac{0.806736 \times 2 + 5\%(n)}{0.0025}$$

$$= 322.69 \times 2 + 16.1345$$

$$= 645.38 + 16.1345 = 661.52$$

$$= 662$$

Thus, sample size = 662

Number of cluster = 3

$$\text{Therefore, number of sample per cluster} = \frac{662}{3}$$

$$= 221$$

## 2.4 Study Area

The study was conducted in three areas of Port Harcourt (Rivers State, Nigeria) and its environs.

These were D/line, a major business and medium densely populated residential area, Mile IV (Rumueme), a highly densely populated residential area and Rumuosi, a farming community, in a semi-urban setting. Port Harcourt, a metropolitan city, is the capital of River State in South-south geopolitical zone of Nigeria, lying along Bonny River with its many creeks. It is host to many major companies, and is one of the major economic centers in Nigeria. Port Harcourt is one of the largest cities in Nigeria with an estimated population of 1, 865, 000 inhabitants [15] located in the forest belt of Nigeria with a lengthy and heavy wet climate. It has a very short dry season and the average temperature is between 25°C and 28°C (Fig. 1).

## 2.5 Study Design

The design was a cross-sectional descriptive one.

## 2.6 Sampling Method

Twenty four (24) drugstores whose owners gave written consent were randomly enrolled for the study. There were Eight (8) drugstores per cluster. Clients patronising participating drugstores for antimalarial to treat perceived malaria were approached for written consent to participate in the study. They were informed that they will be offered a free malaria test before drug administration.

**Questionnaire:** A semi structured questionnaire was used to obtain socio-demographic characteristics and the participant's Knowledge, Attitude and practice (KAP) on malaria. The questionnaire was administered after an informed consent had been obtained.

**Sample Collection:** Whole blood samples were collected from participants by venepuncture, using established practice. The samples were put in a clean well labelled container, containing anticoagulant (EDTA). RDT was conducted immediately. The samples were then put into a box and transported to the laboratory. Thick and thin blood film preparation for Giemsa staining technique was performed on all samples for parasite identification and quantification.

**Rapid Diagnostic Test (RDT):** RDT was performed on the samples immediately after collection using a standard RDT kit (Aria, manufactured by CTK Biotech, Inc., San Diego, CA 92121, USA).

The kit contains a pouch, which was opened and placed on a clean flat surface. It was labelled with the participants' identification (ID) number. Proper mixing of the sample was then done. With the aid of a mini plastic dropper (blood transfer device) that came with the kit, 5µl of blood was obtained. Holding the device vertically, the blood was transferred into the sample well(s) in the pouch, ensuring that there were no bubbles. Immediately holding the buffer lysis bottle vertically, two drops of lysis buffer was added to the buffer well in the pouch. The pouch was allowed to stand for 20 minutes after which the result was read. If sample was negative, participants were advised against the purchase of anti malarials.

**Interpretation of Test:** There were three bands on the RDT pouch. These bands were the C

(control),  $P_V$  (*Plasmodium vivax*), and  $P_f$  (*Plasmodium falciparum*). A negative result was indicated by a burgundy colour on the C band and non on the  $P_V$  and  $P_f$  bands. A burgundy colour on the C band and on the  $P_V$  or  $P_f$  bands or both indicated a positive result. The absence of a burgundy colour on the C band, irrespective of presence on the  $P_V$  and  $P_f$  bands, indicated an invalid result.

**Microscopy:** Thick and thin blood films were prepared, stained using Giesma staining technique and examined following method described by Cheesbrough [16].

The thick blood films were allowed to air dry and transferred to a staining rack. They were then flooded with a freshly prepared Giemsa working solution for 30 minutes.

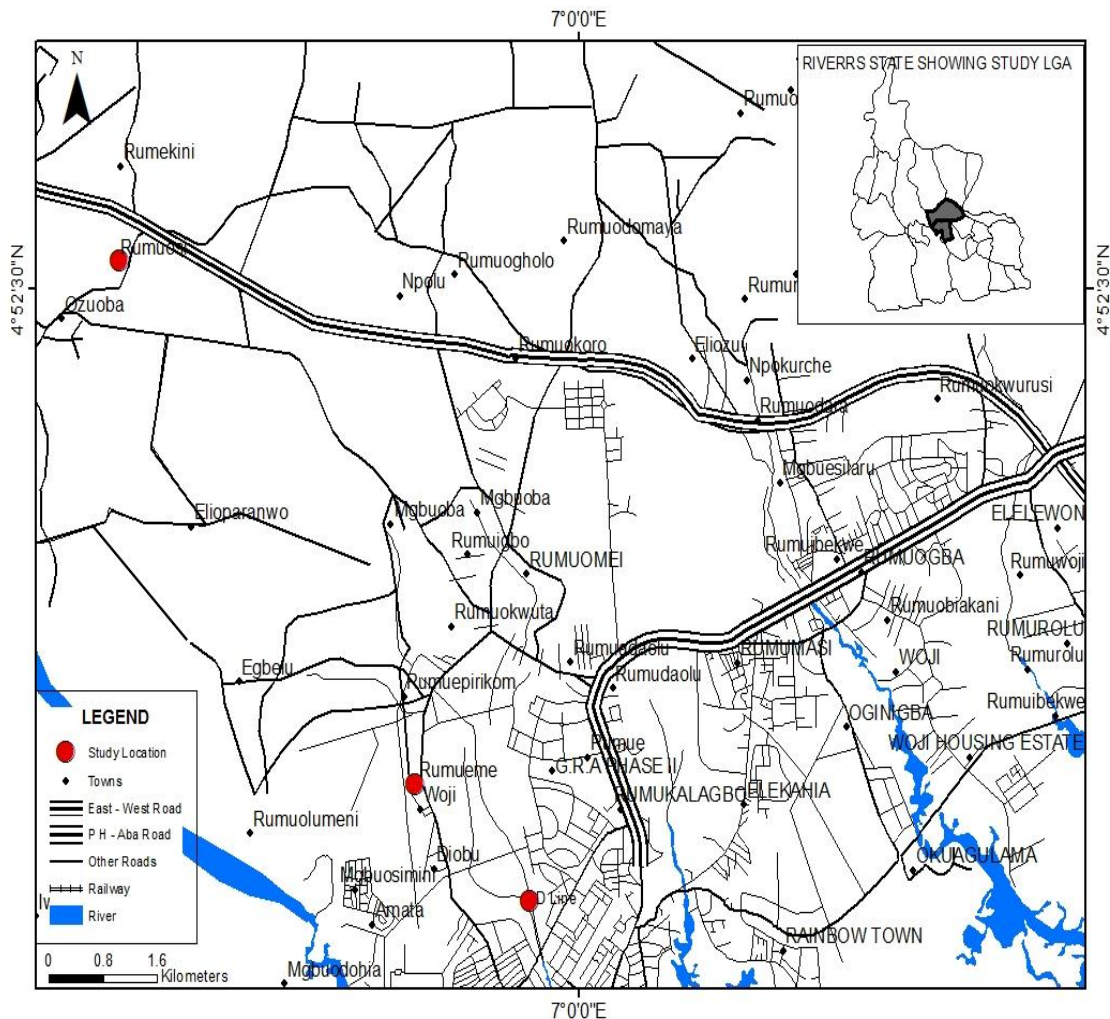


Fig. 1. Map of Port Harcourt (Rivers state, Nigeria) and its environs showing sample location

The slides were flushed with water, allowed to dry and examined with x100 objective of the microscope for the presence of *Plasmodium* parasite.

## 2.7 Data Analysis and Presentation

The data was entered on Microsoft excel and spreadsheets, transferred to and analysed using the latest version of Statistical Package for the Social Sciences (SPSS version 22). It was presented as tables.

## 3. RESULTS

Occurrence of Malaria among Persons Patronising Drugstores for Malaria Treatment in Port Harcourt and its Environs showed that a total of 663 participants took part in this study. Out of which 151 (22.8%) tested positive for malaria. *P. falciparum* was found to be responsible for all the positive cases. None tested positive for *P. vivax*.

Mile IV (Rumueme) had the highest occurrence of positive cases. They were 68 (30.8%) out of the 221 cases. Rumuosi had 51 (23.1%). The least occurrence was found in D/Line area. This was 32 (14.5%) out of 221 participants. The prevalence of malaria in D/Line was significantly lower ( $X^2=16.7$ ,  $P=0.001$ ) than that in Rumueme or Rumuosi.

Socio-demographic characteristics of Persons Patronising Drugstores for Malaria Treatment in Port Harcourt and its Environs showed that for age range, the ages (Table 1) varied from those below 18 to those above 25 years. There was a significant difference in the ages of the participants in the three study sites. Twenty five years and above were the highest participants with 159 (71.8%) in D/line, 146 (66.1%) in Mile IV and 153 (69.2%) in Rumuosi. This was followed by those of ages 18 to 25 and finally by those of ages below 18.

For Sex, More males than females participated in the study. Overall, there was no significant difference in the proportion of males and females who patronised drugstores for malaria treatment, though in Mile IV, the difference was significant, with 124 (56.1%) being males and 97 (43.9%) being females. The  $X^2$  value was 6.6 and  $p = 0.01$  (Table 2). On marital status, it was observed that more single people patronised the drugstores for antimalarial treatment than the married, divorced, widows or widowers. 369 (55.7%) of the participants were single

individuals, 258 (38.9%) divorced, 13 (1.9%) widows and 10 (1.2%) widowers (Table 3).

The Knowledge of Persons Patronising Drugstores for Malaria Treatment in Port Harcourt and its Environs on Malaria is as shown on Table 4. It was observed that there was significance in the knowledge of the respondents regarding malaria. Of the 663 participant, 653 (98.5%) were aware of what malaria is. In all, 649 (97.9%) believed that mosquito causes malaria while 4 (0.6%) and 73 (11.0%) were of the opinion that bad food and dirty environment, respectively, bring about malaria illness. There was a significant knowledge as to the fact that mosquito bite was responsible for malaria across the study areas. A total of 341 (51.4%) believed malaria can be diagnosed by visiting a laboratory, while 253 (38.2%) believed by visiting the hospital/clinic, 5 (0.8%) and 3 (0.5%) were of the opinion that other people and pharmacy/chemist respectively can give proper diagnosis of malaria. On malaria prevention, 643 (97.0%) of the participants felt malaria could be prevented. Most of the participants 644 (97.1%) believed that malaria could be prevented by sleeping under Long Lasting Insecticide Treated Nets (LLITN) while 621 (93.7%) believed that it could be prevented by using insecticide sprays. This Percentage 323 (48.7%) believed that putting nets on door/windows malaria could be prevented. Only 7 (1.1%) of the participants believed that malaria could be prevented by improving personal hygiene. While only 2 (0.3%) believed that by wearing protective clothing, malaria could be prevented.

Knowledge score on malaria of persons Patronising Drugstores for Malaria Treatment in Port Harcourt and its Environs showed that 644 (97.1%) of the respondents had a good knowledge of malaria while 19 (2.9%) had poor knowledge and it was the same trend in all the study areas using the 10 characteristics for the assessment. Anyone who scored  $\geq 5$  was considered to have good knowledge and anyone who scored  $\leq 4$  was considered to have poor knowledge: D/line 214 (96.8%) / 7 (3.2%), Mile iv(Rumueme) 214 (96.8%) / 7 (3.2%) and Rumuosi 216 (97.7%) / 5 (2.3%) of good to poor knowledge respectively. The differences were statistically significant across the study areas ( $P=0.001$ ).

The attitude of the respondents regarding malaria showed that most of the respondent 328 (49.5%) would seek treatment after 2 days of

feeling they had malaria while 321 (48.4%) would seek treatment immediately they observed the symptoms of malaria. Only 11 (1.7%) would wait for 3 to 7 days before seeking treatment and 3 (0.5%) would seek treatment after a week of having symptoms (Table 5). A significant number of 592 (89.3%) would visit hospital or clinic when they felt they had malaria, while only 7(1.1%) would visit the drug store. A significant number of the participant, 661 (99.7%) believed malaria could be treated while 2 (0.3%) don't believe it could be treated. Significant number, 623 (94.0%) of the participants believed that one needed to go for a test before treatment. As to while they preferred drugstores to visiting hospital/clinic many did not respond. Only 10(1.5 %) people responded that it was easier to obtain the drugs from the drugstores. After statistical analysis, 648 (97.7 %) of the participants showed good attitude regarding malaria as against 15 (2.3 %) who showed poor attitude. It was similar observation in all the study areas; D/line 214 (96.8 % / 7 (3.2%), Mile iv (Rumueme) 216 (97.7 %) / 5 (2.3%), Rumuosi 218 (98.6%) / 3 (1.4%) of good to poor attitudes respectively.

Practice of Persons Patronising Drugstores for Malaria Treatment in Port Harcourt and its Environs on Malaria showed that 649 (97.9%) would not do laboratory diagnosis (test) before seeking treatment, only 14 (2.1%) of the participants would go for laboratory test before treatment (Table 6). On wearing of protective cloth in the evening only 2 (0.3%) would wear protective clothing. Most of the participants, 661 (99.7%) would not wear any protective cloths against mosquitoes. There was no significant difference in these practices across the study areas.

Out of the 663 respondents, only 149 (22.5%) had a mosquito net, 514 (77.5%) did not have one. Out of those that had one, only 101 (15.2 %) slept under it. while 48 (7.2%) did not sleep under it. This practice cut across the study areas. From statistical analysis of the participants practice, it was found that 596 (89.9%) of the participants had poor practice. Only 107 (16.1%) had good practice. The trend was the same in D/line 63 (28.5%) / 158 (71.5%), Mile iv (Rumueme) 23 (10.4%) / 198 (89.5%) and Rumuosi 21 (9.5%) / 210 (90.5%) of good to poor practice respectively. There was no significant difference in practice on malaria across the three study areas. ( $X^2 = 38.5$ ;  $p = 5.991$ ).

#### 4. DISCUSSION

The present study shows that only 22.8% of those who patronised drug store for malaria treatment actually tested positive for malaria, a figure higher than the 3.9% reported from Ibadan in Southwest Nigeria [6] or the 3.0% reported from this same study area in an earlier study [17]. However, the figure is lower than 35.5% reported on malaria infection and socioeconomic status of some residents of Port Harcourt [18]. The low prevalence recorded in Ibadan [6] and in Port Harcourt [17] could be location dependent and level of health awareness. Ibadan is located in the western part of Nigeria, with an environment that is not as conducive as Port Harcourt for the breeding of mosquitoes. The University of Port Harcourt study [17] was carried out in an academic community.

In this study, it was observed that the patronage of drugstores for malaria treatment was mostly by persons of ages 25 years and above who are single with a tertiary education as against persons with other levels of education. It was also observed that they were mostly unemployed and more males than females. Most of these socio-demographic characteristics agree with the findings of other researchers [6,19,20]. For example, significant number of respondent agreed that treatment of malaria is better achieved by seeking treatment in hospitals and clinics and also in their study in Zambia [19], Mulenga and Kawmibe reported that parents preferred taking their younger ones to the formal health sector. The finding in this study is in agreement with an earlier study [6] that the single and unemployed were more likely to patronise drugstores for malaria treatment than married and employed person. This might be due to the fact that the unemployed find drugstores cheaper than visiting a health facility. Married person are also more cautious than single people as a result of exposure and experience in life. This fact also goes for females, which might be the reason why males patronise drugstores more as reported in another study in Enugu State, Southeast Nigeria [20]. However, the result of this study does not agree with those of Mulenga and Kwamibe [19] as to the educational status of persons that patronise drugstores for malaria treatment. They observed the highest patronage from those with secondary education (53.3%) as against 20% and 26.7% patronage by those with tertiary and primary education respectively.

**Table 1. Age range of persons patronizing drugstores for malaria treatment in Port Harcourt and its environs**

Age range	Study area (n=663)			Total	Chi-square ( $\chi^2$ ) (p-value)
	D LINE (n=221) Freq (%)	MILE IV (RUMUEME) (n=221) Freq (%)	RUMUOSI (n=221) Freq (%)		
Below 18	25 (11.31)	36 (16.29)	25 (11.31)	86 (12.97)	3.84 (0.428)
18-25	37 (16.74)	39 (17.65)	43 (19.46)	119 (17.95)	
25/above	159 (71.95)	146 (66.06)	153 (69.23)	458 (69.08)	
$\chi^2$ (p-value)	223.87 (0.001)*	159.90 (0.001)*	195.53 (0.001)*		

Statistically significant ( $p < 0.05$ )**Table 2. Sex of persons patronizing drugstores for malaria treatment in Port Harcourt and its environs**

Sex	Study area (n=663)			Total	Chi-square ( $\chi^2$ ) (p-value)
	D/LINE (n=221) Freq (%)	MILE IV (RUMUEME) (n=221) Freq (%)	RUMUOSI (n=221) Freq (%)		
Male	118 (53.39)	124 (56.11)	115 (52.04)	357 (53.85)	0.76 (0.684)
Female	103 (46.61)	97 (43.89)	106 (47.96)	306 (46.15)	
$\chi^2$ (p-value)	2.04 (0.154)	6.60 (0.01)*	0.73 (0.391)		

Statistically significant ( $p < 0.05$ )**Table 3. Marital status of persons patronizing drugstores for malaria treatment in Port Harcourt and its environs**

Marital status	D/Line (n=221) Freq (%)	Study Area (n=663)		Rumuosi (n=221) Freq. (%)	Total $\chi^2$ (P-value) (n=663 freq (%))
		Mile IV (Rumueme) (n=22) Freq. (%)			
Single	123 (55.6)	135 (61.09)		111 (50.23)	7.36 (0.498)
Married	85 (38.46)	77 (34.84)		96 (43.44)	
Divorced	4 (1.81)	4 (1.81)		5 (2.26)	
Widow	4 (1.81)	1 (0.45)		5 (2.26)	
Widower	5 (2.26)	4 (1.81)		4 (1.81)	
$\chi^2$ (p-value)	357.55 (0.001)*	407.77 (0.001)*		334.69 (0.001)*	

Statistically significant ( $p < 0.05$ )

Table 4. Knowledge of persons patronizing drugstores for malaria treatment in Port Harcourt and its environs on malaria

Characteristics	Study area			Total n=663 Freq (%)	Chi-square ( $\chi^2$ ) (p-value)
	D LINE (n=221) Freq (%)	MILE IV (RUMUEME) (n=221) Freq (%)	RUMUOSI (n=221) Freq (%)		
<b>Do you know what malaria is</b>					
Yes	217 (98.19)	216 (97.74)	220 (99.55)	653 (98.49)	2.64 (0.267)
No	4 (1.81)	5 (2.26)	1 (0.45)	10 (1.51)	
<b><math>\chi^2</math>(p-value)</b>	410.58 (0.001)*	402.90 (0.001)*	434.04 (0.001)*		
<b>Causes of malaria (Multiple response)</b>					
Eating oily food	3 (1.27)	0 (0.0)	1 (0.41)	4 (0.55)	4.92 (0.295)
Mosquito bite	212 (89.83)	216 (88.16)	221 (90.20)	649 (89.39)	
Dirty environment	21 (8.90)	29 (11.84)	23 (9.39)	73 (10.06)	
<b>Total</b>	<b>236</b>	<b>245</b>	<b>245</b>	<b>726</b>	
<b><math>\chi^2</math>(p-value)</b>	511.56 (0.001)*	504.89(0.001)*	539.31(0.001)*		
<b>How do you know that one has malaria (Multiple response)</b>					
From other people	1 (0.51)	3 (1.59)	1 (0.46)	5 (0.83)	6.98 (0.322)
Hospital/Clinic	75 (38.46)	73 (38.62)	105 (48.17)	253 (42.03)	
Laboratory	118 (60.51)	112 (59.26)	111 (50.92)	341 (56.64)	
Pharmacy/Chemist	1 (0.51)	1 (0.53)	1 (0.46)	3 (0.49)	
<b>Total</b>	<b>195</b>	<b>189</b>	<b>218</b>	<b>602</b>	
<b><math>\chi^2</math>(p-value)</b>	274.73(0.001)*	252.63(0.001)*	280.54(0.001)*		
<b>Can malaria be prevented</b>					
Yes	214 (96.83)	214 (96.83)	215 (97.29)	643 (96.98)	0.1 (0.951)
No	7 (3.17)	7 (3.17)	6 (2.71)	20 (3.02)	
<b><math>\chi^2</math>(p-value)</b>	387.77 (0.001)*	387.77 (0.001)*	395.30 (0.001)*		
<b>How malaria can be prevented (Multiple response)</b>					
Improving personal hygiene	2 (0.39)	3 (0.57)	2 (0.36)	7 (0.44)	5.78 (0.672)
Wearing protective clothing	1 (0.19)	1 (0.19)	0 (0.0)	2 (0.13)	
Sleeping under ITN	211 (40.66)	218 (41.68)	215 (38.74)	644 (97.13)	
Putting nets on doors/windows	100 (19.27)	95 (18.16)	128 (23.06)	323 (48.71)	
using insecticide spray	205 (39.50)	206 (39.39)	210 (37.84)	621 (93.67)	
<b>Total</b>	<b>519</b>	<b>523</b>	<b>555</b>	<b>1597</b>	
<b><math>\chi^2</math>(p-value)</b>	513.93 (0.001)*	529.27(0.001)*	507.97(0.001)*		

\*Statistically significant (p&lt;0.05)



Table 5. Attitude of Persons Patronizing Drugstores for Malaria Treatment in Port Harcourt and its Environs on Malaria

Characteristics	Study area (n=663)			Total	Chi-square ( $\chi^2$ ) (p-value)
	D LINE (n=221) Freq (%)	MILE IV (RUMUEME) (n=221) Freq (%)	RUMUOSI (n=221) Freq (%)		
<b>Length of waiting before seeking treatment</b>					
Immediately	116 (52.49)	95 (42.99)	110 (49.77)	321 (48.42)	4.84 (0.564)
After 2-3days	100 (45.25)	120 (54.30)	108 (48.87)	328 (49.47)	
After 3-7 days	4 (1.81)	5 (2.26)	2 (0.90)	11 (1.66)	
After a week	1 (0.45)	1 (0.45)	1 (0.45)	3 (0.45)	
<b><math>\chi^2</math>(p-value)</b>	271.80 (0.001)*	271.27 (0.001)*	278.94 (0.001)*		
<b>How do you normally treat malaria</b>					
Takes herbal medicine	4 (1.81)	3 (1.36)	6 (2.71)	13 (1.96)	40.24 (0.001)*
Visit to hospital and clinics	198 (89.59)	207 (93.67)	187 (84.62)	592 (89.29)	
Visit to lab	2 (0.90)	2 (0.90)	0 (0.0)	4 (0.60)	
Visit to pharmacy and clinic	5 (2.26)	2 (0.90)	0 (0.0)	7 (1.06)	
Visit to traditional herbalist	12 (5.43)	7 (3.17)	28 (12.67)	47 (7.09)	
<b><math>\chi^2</math>(p-value)</b>	837.81 (0.001)*	937.41 (0.001)*	735.88 (0.001)*		
<b>Do you believe that Malaria can be treated</b>					
Yes	219 (99.1)	221 (100.0)	221 (100.0)	661 (99.70)	3.98 (0.137)
No	2 (0.90)	0 (0.0)	0 (0.0)	2 (0.30)	
<b><math>\chi^2</math>(p-value)</b>	426.14 (0.001)*	422.0 (0.001)*	422.0 (0.001)*		
<b>Do you believe that testing before treatment is necessary</b>					
Yes	217 (98.19)	219 (99.10)	219 (99.10)	655 (98.79)	1.0 (0.611)
No	4 (1.81)	2 (0.90)	2 (0.90)	8 (1.21)	
<b><math>\chi^2</math>(p-value)</b>	410.58 (0.001)*	426.14 (0.001)*	426.14 (0.001)*		
<b>Are you aware that you should test after treatment malaria</b>					
Yes	203 (91.86)	208 (94.12)	212 (95.93)	623 (93.97)	3.25 (0.197)
No	18 (8.14)	13 (5.88)	9 (4.07)	40 (6.03)	
<b><math>\chi^2</math>(p-value)</b>	309.73 (0.001)*	344.12 (0.001)*	372.93 (0.001)*		
<b>Why do you not visit hospitals/clinic</b>					
Because one can get the drugs from pharmacy	2 (50.0)	1 (50.0)	0 (0.0)	3 (30.0)	10.0 (0.040)
Drug doesn't work for me	2 (50.0)	1 (50.0)	0 (0.0)	3 (30.0)	
I don't like drugs	0 (0.0)	0 (0.0)	4 (100.0)	4 (40.0)	
<b><math>\chi^2</math>(p-value)</b>	3.0 (0.223)		12.0 (0.002)*		

\*Statistically significant (p&lt;0.05)

Table 6. Practice of persons patronizing drugstores for malaria treatment in Port Harcourt and its environs on malaria

Characteristics	Site area (n=663)			Total	Chi-square ( $\chi^2$ ) (p-value)
	D LINE (n=221) Freq (%)	MILE IV (RUMUEME) (n=221) Freq (%)	RUMUOSI (n=221) Freq (%)		
<b>Do you have mosquito net</b>					
Yes	47 (21.27)	53 (23.98)	49 (22.17)	149 (22.47)	0.48 (0.787)
No	174 (78.73)	168 (76.02)	172 (77.83)	514 (77.53)	
$\chi^2$ (p-value)	145.96 (0.001)*	119.68 ((0.001)*)	136.91 (0.001)*		
<b>Do you sleep under it</b>					
Yes	32 (68.09)	36 (67.92)	33 (67.35)	101 (67.79)	0.01 (0.991)
No	15 (31.91)	17 (32.08)	16 (32.65)	48 (32.21)	
Total	47	53	49	149	
$\chi^2$ (p-value)	12.30(0.001)*	13.62 (0.001)*	11.80(0.001)*		
<b>Was the Lab diagnosis performed before treatment</b>					
Yes	10 (4.52)	4 (1.80)	0 (0.0)	14 (2.11)	100.40 (0.001)*
No	21 (95.48)	217 (98.20)	221 (100.0)	649 (97.99)	
$\chi^2$ (p-value)	54.26(0.001)*	410.50 (0.001)*	442.0 (0.001)*		
<b>Do you wear protective clothing in the evening</b>					
Yes	1 (0.45)	1 (0.45)	0 (0.0)	2 (0.31)	1.003 (0.606)
No	220 (99.55)	220 (99.55)	221 (100.0)	661 (99.69)	
$\chi^2$ (p-value)	434.04(0.001)*	434.04 (0.001)*	442.0 (0.001)*		

\*Statistically significant (p&lt;0.05)

In terms of knowledge on malaria, 98.5% of the persons were found to have good knowledge. This figure is higher than that obtained in Northern Nigeria [13] and also higher than the 60% target defended by the Abuja summit in 2000 meeting [21]. This study shows that there has been a great improvement in knowledge on malaria over the years. It is also much higher than the 90% reported in some Nigerian communities [11]. In his study in Delta state, participants were assessed based on answers to 10 questions. This included knowledge on the use of ITN and 97.1% had good knowledge on the use of ITN. This is higher than the 87.4% recorded in the western parts of Nigeria [22]. Reasons for this great improvement in knowledge could be as a result of the massive advocacy and enlightenment campaign by Government agencies, stakeholders and their international partners.

The attitude of the participants on malaria was also assessed in this study and 97.4% of them were found to have good attitude which include treatment seeking behaviour. This finding showed great improvement over the 56.7% recorded in Northern Nigeria [13]. Awareness is being created regularly the Northern Nigeria study was carried out in 2014. If another one was to be conducted today, the result would be different. This is as a result of the premium now placed on enlightenment campaign on malaria.

In this term of practice, it was observed that despite good knowledge and attitude, practice was poor. Present study recorded 16.1% good practice and 83.9% poor practice on malaria. This study agrees with similar study in Lagos State [11]. It was observed that good knowledge and attitude on malaria does not translate to good practice. This result is similar to that of other study conducted on the possession and use of ITNs in Nigeria. The study in a rural community in Nigeria observed 87.4% possession but only 10% usage [22]. Also, another study in Northern Nigeria recorded such a similar low practice score of 16% [13]. Nigerians seems not to have assimilated the fact that good knowledge and attitude must translate to good practice.

## 5. CONCLUSION

In conclusion, the malaria infection rate is high in the study area. Knowledge and attitude of the people is impressively high but the practice is low, buttressing the fact that good knowledge

and attitude does not translate to good practice. There is need to intensify effort towards education of the people on the necessity of compliance to good practice as that is the only way the war on malaria control can be effectively won.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

## ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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