Influence of socio-demographic factors, working experience, and previous training experience on the Knowledge, Attitude and Practice of Patent Medicine Vendors in a Nigerian community

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Abstract

Patent Medicine Vendors (PMVs) are non-pharmacist drug retailers and are the commonest sources of Over-the-Counter (OTC) medications and basic health services in sub-Saharan Africa. PMVs provide primary care and are increasingly recognised for their critical role in malaria control, a major public health challenge in the region. The shortage of skilled healthcare professionals necessitates the integration of PMVs into malaria management strategies across endemic regions. This study examines the relationship between PMVs knowledge, attitudes and practices (KAP) and personal factors (including socio-demographic characteristics, working experience and previous training experience). 292 PMV respondents were selected and randomized into intervention and wait-list arms, with 146 respondents in each arm respectively. Simple random sampling and systematic random sampling techniques were used to select the local government councils and subsequently participants from the study district respectively. Baseline KAP data encompassing varying ages, gender, educational levels, working experiences and training experiences were analysed using SPSS version 26, to ascertain the influencing factors. Total response rate was 99.6%, with 100% and 99.3% for intervention and wait-list arms respectively. Knowledge, attitudes and the practices of respondents all showed statistically significant relationships with educational levels ($p<0.001$). But only knowledge showed significant relationship with attending trainings ($p = 0.032$). Conversely respondent's attitudes and practices showed no statistically significant relationship ($p>0.05$) with attending trainings and with working experiences. The study provides evidence that personal factors influence PMV KAP. Specifically, respondents' educational level impacted knowledge, attitudes and practices, while attending trainings only impacted knowledge.

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1.0 Introduction

Over the years malaria has been a major cause of illnesses and death in Nigeria and throughout the tropical and sub-tropical regions of the world, especially among the more vulnerable pregnant women and under five children. Its treatment is usually obtained from a broad range of both the public and private healthcare providers (Chukwuocha *et al*., 2013). The estimated global burden for malaria cases recorded in 2022 reached 249 million, which is well above the projected number of cases before the COVID-19 pandemic, and an increase of five million case over the numbers recorded for the year 2021 (WHO, 2023). An economic burden is also being exerted by the disease on the malaria endemic countries in form of huge loss due to treatment costs, prevention and loss of valuable man-hours annually. This loss according to the Malaria Consortium (2012) was estimated at about N132 billion (£530 million) in Nigeria alone, and it has also been estimated to account for up to 40% of the expenditure on public health (FMH, 2004). These facts and many more informed the inclusion of PMVs in malaria containment efforts in many endemic regions of the world (Yahaya & Halima, 2022), so as to fill the gap created by inadequate manpower and the ease of access to life saving antimalarial therapies.

PMVs have been confirmed to be the most patronised group of healthcare providers on malaria and other common health issues in Nigeria and other countries in the sub-region (Uzochukwu *et al*., 2014; Akuse *et al*., 2010), and up to 60% of all malaria episodes in sub-Saharan Africa region are first treated by private providers, usually through the purchase of drugs from PMV shops (Onwujekwe *et al*., 2005). But yet so far, their activities have neither been well studied nor well documented (Akuse *et al*., 2010) and little is actually known about the PMVs and the poorly regulated market in which they operate (FHS, 2008). A previous study on healthcare-seeking behaviour of persons in Nigeria also found that over 60% of respondents chose to consult PMV as healthcare provider of first instance compared to patronizing the established health facilities (Onyeneho & Chukwu, 2010). PMVs are known to belong to PMV associations, but there are virtually little or no published studies on how PMVs associations help to improve performance of its members.

The Pharmacy Law of Nigeria specifies that PMVs are licensed to handle only pre-packaged 'patented medicines' (Onyeneho & Chukwu, 2010). These laws then permitted the PMVs to sell and distribute antimalarials within their communities due to the malaria scourge. However, despite the enabling laws and the high patronage received by PMVs in the

provision of healthcare, their activities display a serious deficiency in proper knowledge, attitudes and practices (Oyeyemi *et al.,* 2014; Akuse *et al*., 2010; Buabeng *et al*., 2010; Abuya, *et al*., 2010; Okeke & Uzochukwu, 2009; Livinus *et al*., 2009), thereby posing a serious threat to the envisaged potentials that they have been linked with in malaria control and prevention. It then becomes necessary to study and establish the factors influencing the KAP of PMVs so as to be able to manipulate such factors in a view to improving the KAP of PMVs. This study examines KAP relationship with respect to PMVs personal factors, which are the socio-demographic characteristics, working experiences and previous training experiences that are paramount for the challenging role that PMVs are expected to play.

2.0 Materials and Methods

2.1 Study area:
The study was carried out in Yobe-south senatorial district of Yobe State, Nigeria. This district is mostly rural in nature, with a high commercial activity and hence proliferation of PMV activities. The district has an area of 8,695 square kilometers and a total population of 732,548 (NPC, 2009). The district comprises of four Local Government Councils which are Potiskum, Fune, Fika and Nangere.

2.2 Study Design:
The study is a baseline survey preparatory to a Randomised Controlled Trial (RCT) within the four local councils (LC) in which participants were blinded, and it was designed and conducted so as to evaluate the influence of socio-demographic factors (age, gender and educational level), working experiences, and previous training experiences of the respondent PMVs on their knowledge, attitudes and practices.

2.3 Sample Size:
This study was carried out among staff of PMV shops that are operating within the study area, this is because they are the ones constantly dealing with the patients or their caregivers. A sample size of 292 respondents was arrived at (146 respondents for each arm) using the formula for RCTs described by Rosner, (2010), as seen below:

$$N_1 = [Z\propto \sqrt{pq}\left(1 + \frac{1}{k}\right) + Z\beta\sqrt{p1q1} + \frac{p2q2}{k}]^2 / \Delta^2$$

2.4 Procedure:
A Simple Random Sampling technique was used to assign the four LCs in a group randomisation into the Intervention and Wait-list arms. Samples of PMVs from each of the two arms were then selected via a Systematic Random Sampling method, where a list of

total PMVs from both the two LCs in an arm was used to select the required number of respondents respectively. The total number of required respondents of PMVs within the two LCs of an arm (Intervention or Wait-list) was used to calculate the sampling ratio and after the ratio was established, the sampling in each arm started from a random point between 1 and 10 on the list of both arms. This now produced the total samples required for each of the arm. The questionnaires used were coded according to the numbers of participants before the baseline data were collected and checked to confirm for proper completion on collection from participants.

2.5 Data collection Instruments:

The instrument used to collect data was a self-administered questionnaire, this was adopted and modified so as to consider cultural difference and reflect on the interests of communities of the study location. The questionnaire consist of four sections as follows: Section 1 consisting of Socio-demographic characteristics (age, gender and levels of education), working experiences and training experiences of respondents; Section 2 consisted of the malaria knowledge; Section 3 consisted of malaria attitudes and Section 4 consisted of malaria practices. A two-point scale (Yes / No or True / False), and a five-point likert's scale (ranging from strongly disagree to strongly agree) was used to assess the respondent's knowledge, attitudes and practices. The questionnaires were structured in English language, being the medium of communication in the study area.

2.6 Informed consent:

Informed consent was obtained from all individual participants included in the study. Anonymity and confidentiality were also upheld at all times of the study.

2.7 Data analysis:

The collected data were subsequently double entered into an SPSS statistical software version 26 by the researcher and two assistants. All the data were initially subjected to a thorough assessment for missing data, and possible outliers. A test for normality was conducted for the outcome variables with regards to the independent variables using skewness, kurtosis and distribution plots.

The relationships of the socio-demographic factors, working experiences and trainings experiences with regards to KAP of the respondents was established using Chi-square test. This was done by first cross-tabulating all the personal factors against knowledge as a categorical factor (Good Vs Poor) in the analysis. Same procedure was done for attitudes (Positive Vs Negative) and then for practices (Good Vs Poor) respectively.

3.0 Results

3.1 Socio-demographic characteristics of respondents

Table 3.1 below shows the socio-demographic distribution of respondent PMVs. There were more respondents within the 27 – 36 years age group, numbering 109 (37.3%) of total respondents, while only 7 (2.4%) of respondents were 57 years or above. Males were predominant, numbering 282 (96.5 %) in the study than females 10 (3.5 %). Furthermore, there were more secondary school leavers, 159 (54.5%) of total respondents compared to those who attended tertiary institutions 61 (20.9%) and those with primary levels 72 (24.6%). Similarly, respondents who had been practising in the last 6 years or less were more in number 133 (45.6%), while those with up to 28 years or more working experience were the fewest, numbering 7 (2.4%). Most respondents had attended training to become PMVs 264 (90.4%), while those that did not attend training were 28 (9.6%). With a total number of respondents (n = 292) frequencies of sociodemographic characteristics of respondents were obtained as seen below.

Table 3.1: Socio-demographic characteristics of respondents.

Variables	Frequency, n=292 (%)	
	Intervention Arm	**Wait-list Arm**
Age Group (years)		
17-26	25 (8.6)	32 (11.0)
27-36	61 (20.9)	48 (16.4)
37-46	40 (13.7)	47 (16.1)
47-56	17 (5.8)	15 (5.1)
57 and above	3 (1.0)	4 (1.4)
Gender		
Male	140 (47.9)	142 (48.6)
Female	6 (2.1)	4 (1.4)
Educational Level attained		
Tertiary	28 (9.6)	33 (11.3)
Secondary	84 (28.8)	75 (25.7)
Primary	34 (11.6)	38 (13.0)
No formal education	0 (0)	0 (0)
Years of Practice		
0-6	70 (24.0)	63 (21.6)
7-13	44 (15.1)	41 (14.0)
14-20	17 (5.8)	29 (9.9)
21-27	11 (3.8)	10 (3.4)
28 and above	4 (1.4)	3 (1.0)
Training as PMV		
Had Training to become PMV	129 (44.5)	135 (45.9)
Never had Training to become PMV	16 (5.5)	12 (4.1)

3.2 Effects of Sociodemographic factors, Working Experiences and Training Experiences on the

Knowledge, Attitudes and Practices (KAP) of Respondents.

The effects of the different age groups, gender of participants, educational levels attained, the working experiences (years of practice as PMV) and attendance of training to practice as PMV on the KAP of respondents were tested as seen in the tables below:

3.2.1 Effects of Sociodemographic factors, Working Experiences and Training Experiences on the knowledge of Respondents.

There was no statistically significant difference between the different age groups of respondents in terms of knowledge performance in both arms of the study (p = 0.982) as seen in Table 3.2 By this finding, the different age groups of respondents has been shown to exert no significant influence on the knowledge performance of the respondents.

Similarly, Table 3.2 shows that the difference in gender of participants gave no statistically significant difference in the knowledge of respondents in both arms of the study, (p = 0.247). This result signifies that gender of participants had no significant influence on the knowledge performance of respondents in both arms of the study.

Conversely, Table 3.3 shows that there was an observable statistically significant difference in knowledge performance of respondents with respect to their attained levels of education, thus showing more respondents from tertiary levels with sound knowledge in both arms of the study (p = <0.001). This shows that educational levels attained has significant influence on knowledge of respondents.

Table 3.3 also shows that there was no statistically significant difference in knowledge assessment of participants regarding their various years of practice in both arms respectively (p = 0.764). This result also signifies that 'years of experience' of respondents had no statistically significant influence on the knowledge levels of respondents.

Again, Table 3.3 shows that there is a statistically significant difference in knowledge between respondents that attended a training before practising as PMVs and those that did not attend from both arms of the study respondents. (p = 0.032). This also signifies that attending a training to become PMV significantly influence the knowledge levels of respondents.

Table 3.2: Effect of age group & gender of respondents on the knowledge of respondents.

	Variables	Knowledge Assessment N (%)		p value
	Age Group (Years)	Poor Knowledge	Good Knowledge	
Intervention	17 - 26	24 (16.4)	1 (0.7)	
	27 - 36	58 (39.7)	3 (2.1)	

	37 - 46	38 (26.0)	2 (1.4)	
	47 - 56	16 (11)	1 (0.7)	
	57 and above	3 (2.1)	0 (0.0)	
	Total	139 (95.2)	7 (4.8)	0.982
Waitlist	17 - 26	31 (21.4)	1 (0.7)	
	27 - 36	47 (32.4)	0 (0.0)	
	37 - 46	47 (32.4)	0 (0.0)	
	47 - 56	15 (10.3)	0 (0.0)	
	57 and above	4 (2.8)	0 (0.0)	
	Total	144 (99.3)	1 (0.7)	
	Gender Effect			
Intervention	Male	134 (91.8)	6 (4.1)	
	Female	5 (3.4)	1 (0.7)	
	Total	139 (95.2)	7 (4.8)	0.247
Waitlist	Male	140 (96.6)	1 (0.7)	
	Female	4 (2.8)	0 (0.0)	
	Total	144 (99.3)	1 (0.7)	

p-value calculated using Chi-square test (χ^2)

Table 3.3: Effect of the Educational levels attained, years of practice & having attended a training before becoming PMV on the knowledge of respondents.

	Variables	Knowledge Assessment N (%)		p value
	Educational levels attained	Poor Knowledge	Good Knowledge	
Intervention	Tertiary	21 (14.4)	7 (4.8)	
	Secondary	84 (57.5)	0 (0.0)	
	Primary	34 (23.3)	0 (0.0)	
	Total	139 (95.2)	7 (4.8)	
Waitlist	Tertiary	32 (22.1)	1 (0.7)	<0.001*
	Secondary	74 (51.0)	0 (0.0)	
	Primary	38 (26.2)	0 (0.0)	
	Total	144 (99.3)	1 (0.7)	
	Years of Practice			
Intervention	0 - 6	66 (45.2)	4 (2.7)	
	7 - 13	43 (29.5)	1 (0.7)	
	14 – 20	16 (11.0)	1 (0.7)	
	21 – 27	10 (6.8)	1 (0.7)	
	28 and Above	4 (2.7)	0 (0.0)	
	Total	139 (95.2)	7 (4.8)	
Waitlist	0 - 6	62 (42.8)	1 (0.7)	0.764
	7 - 13	40 (27.6)	0 (0.0)	
	14 – 20	29 (20.0)	0 (0.0)	
	21 – 27	10 (6.9)	0 (0.0)	
	28 and Above	3 (2.1)	0 (0.0)	
	Total	144 (99.3)	1 (0.7)	
	Training to become PMV			
Intervention	Attended training to become a PMV	126 (86.3)	4 (2.7)	
	Never attended training to be a PMV	13 (8.9)	3 (2.1)	
	Total	139 (95.2)	7 (4.8)	0.032*
Waitlist	Attended training to become a PMV	132 (91.0)	1 (0.7)	
	Never attended training to be a PMV	12 (8.3)	0 (0.0)	
	Total	144 (99.3)	1 (0.7)	

p-value calculated using Chi-square test (χ^2)
*Significant at p < 0.05

3.2.2: Effects of Sociodemographic factors, Working Experiences and Training Experiences on the Attitudes of Respondents.

There was no significant difference in attitude performances due to the difference in various age groups in both arms of the study (p = 0.271) as seen in Table 3.4 below. By this finding, the different age groups of respondents had no significant influence on the attitude performance of the respondents.

Similarly, Table 3.4 also shows that differences in gender of participants produced no significant difference in the attitude performances of respondent PMVs in both the two arms respectively (p = 0.509), this result signifies that gender had no significant influence on performance of respondents in terms of attitudes for both arms.

On the other hand, Table 3.5 shows that a statistically significant difference was observable in the attitude performance of respondents in terms of their different levels of education attained, showing more respondents from tertiary level group with positive attitudes in both the study groups (p <0.001) respectively, this observation signifies that the educational levels attained has a significant influence on the attitude performances of respondents.

Again, Table 3.5 shows that there was no significant difference in attitude performances of participants with respect to their various years of practice in both arms of the study respectively (p = 0.252). This result signifies that 'years of experience' of the participants had no impact on their performances in attitudes.

Respondents who had attended training before become PMV showed no statistically significant difference in attitude assessment compared to those who had no training (p = 0.068) in both arms of the study respectively, as seen in Table 3.5. This showed that the attendance of a training before becoming PMV had not impacted on the attitudes of respondents.

Table 3.4: Effect of Age group & gender of respondents on the attitudes of respondents.

	Variables	Attitude Assessment N (%)		p value
	Age Group (Years)	Negative Attitude	Positive Attitude	
Intervention	17 - 26	13 (8.9)	12 (8.2)	
	27 - 36	27 (18.5)	34 (23.3)	
	37 - 46	8 (5.5)	32 (21.9)	
	47 - 56	16 (11.0)	1 (0.7)	
	57 and above	6 (4.1)	0 (0.0)	
	Total	57 (39.0)	89 (61.0)	
Waitlist	17 - 26	14 (9.7)	18 (12.4)	0.271
	27 - 36	16 (11.0)	31 (21.4)	
	37 - 46	15 (10.3)	32 (22.1)	
	47 - 56	4 (2.8)	11 (7.6)	
	57 and above	3 (2.1)	1 (0.7)	
	Total	52 (35.9)	93 (64.1)	

	Gender Effect			
Intervention	Male	54 (37.0)	86 (58.9)	
	Female	3 (2.1)	3 (2.1)	
	Total	57 (39.0)	89 (61.0)	
Waitlist	Male	50 (34.5)	91 (62.8)	0.509
	Female	2 (1.4)	2 (1.4)	
	Total	52 (35.9)	93 (64.1)	

p-value calculated using Chi-square test (χ^2)

Table 3.5: Effect of the educational levels attained, years of practice & having attended a training before becoming PMV on the attitudes of respondents.

	Variables	Attitude Assessment N (%)		p value
	Educational levels attained	Negative Attitude	Positive Attitude	
Intervention	Tertiary	6 (4.1)	22 (15.1)	
	Secondary	36 (24.7)	48 (32.9)	
	Primary	15 (10.3)	19 (13.0)	
	Total	57 (39.0)	89 (61.0)	<0.001*
Waitlist	Tertiary	1 (0.7)	32 (22.1)	
	Secondary	32 (22.1)	42 (29.0)	
	Primary	19 (13.1)	19 (13.1)	
	Total	52 (35.9)	93 (64.1)	
	Years of Practice			
Intervention	0 - 6	26 (17.8)	44 (30.1)	
	7 - 13	20 (13.7)	24 (16.4)	
	14 – 20	3 (2.1)	14 (9.6)	
	21 – 27	6 (4.1)	5 (3.4)	
	28 and Above	2 (1.4)	2 (1.4)	
	Total	57 (39.0)	89 (61.0)	0.252
Waitlist	0 - 6	21 (14.5)	42 (29.0)	
	7 - 13	15 (10.3)	25 (17.2)	
	14 – 20	8 (5.5)	21 (14.5)	
	21 – 27	5 (3.4)	5 (3.4)	
	28 and Above	3 (2.1)	0 (0.0)	
	Total	52 (35.9)	93 (64.1)	
	Training to become a PMV			
Intervention	Attended training to become a PMV	48 (32.9)	82 (56.2)	
	Never attended training to be a PMV	9 (6.2)	7 (4.8)	0.068*
	Total	57 (39.0)	89 (61.0)	
Waitlist	Attended training to become a PMV	46 (31.7)	87 (60.0)	
	Never attended training to be a PMV	6 (4.1)	6 (4.1)	
	Total	52 (35.9)	93 (64.1)	

p-value calculated using Chi-square test (χ^2)
*Significant at p < 0.05

3.2.3: Effects of sociodemographic factors, working experiences and training experiences on the practices of respondents.

There were no observable statistically significant differences in the respondents practice performances as a result of the different age groups in both arms of the study respectively, ($p = 0.487$) as seen in Table 3.6 below. This finding shows that different age groups of respondents exert no significant influence on the practice performance of the respondents.

Similarly, Table 3.6 also shows that the differences in gender of participants produced no statistically significant difference in the respondents practice performances in both the two study arms respectively ($p = 0.533$). This also signifies that gender of participants had no effect on the performance of respondent's practices for all participants.

Conversely, a statistically significant difference was observed in the respondents practice performances with respect to their different levels of education attained ($p < 0.001$) as seen in Table 3.7. The results showed more respondents from tertiary level group with good practices in both arms of the study respectively.

Table 3.7 also showed no statistically significant difference in practice assessments of participants with respect to their various years of practice in both arms respectively, ($p = 0.552$). This result also shows that the different years of experience of respondents had not impacted on the performances of respondents in terms of practices.

Furthermore, Table 3.7 shows that respondents who attended training before becoming PMVs showed no significant difference in practice assessments ($p = 0.438$) from those who never attended a training to become PMVs. This also shows that attending a training to become PMV does not influence practices of the respondent PMVs.

Table 3.6: Effect of age group & gender on the practices of respondents.

Variables	Practice Assessment N (%)		p value
Age Group (Years)	**Poor Practice**	**Good Practice**	
Intervention			
17 - 26	24 (16.4)	1 (0.7)	
27 - 36	58 (39.7)	3 (2.1)	
37 - 46	38 (26.0)	2 (1.4)	
47 - 56	17 (11.6)	0 (0.0)	
57 and above	2 (1.4)	(0.7)	
Total	139 (95.2)	7 (4.8)	
			0.487
Waitlist			
17 - 26	31 (21.4)	1 (0.7)	
27 - 36	39 (26.9)	8 (5.5)	
37 - 46	44 (30.3)	3 (2.1)	
47 - 56	13 (9.0)	2 (1.4)	
57 and above	4 (2.8)	0 (0.0)	
Total	131 (90.3)	14 (9.7)	
Gender Effect			
Intervention	Male	133 (91.1)	7 (4.8)	
	Female	6 (4.1)	0 (0.0)	
	Total	139 (95.2)	7 (4.8)	0.533
Waitlist	Male	128 (88.3)	13 (9.0)	
	Female	3 (2.1)	1 (0.7)	
	Total	131 (90.3)	14 (9.7)	

p-value calculated using Chi-square test (χ^2)

Table 3.7: Effect of the educational levels attained, years of practice & having attended a training before becoming PMV on the practices of respondents.

Variables Educational levels attained	Attitude Assessment N (%)		p value
	Negative Attitude	**Positive Attitude**	
Intervention			
Tertiary	22 (15.1)	6 (4.1)	
Secondary	83 (56.8)	1 (0.7)	
Primary	34 (23.3)	0 (0.0)	
Total	139 (95.2)	7 (4.8)	
			<0.001*
Wait-list			
Tertiary	20 (13.8)	13 (9.0)	
Secondary	73 (50.3)	1 (0.7)	
Primary	38 (26.2)	0 (0.0)	
Total	131 (90.3)	14 (9.7)	
Years of Practice			
Intervention			
0 - 6	66 (45.2)	4 (2.7)	
7 - 13	43 (29.5)	1 (0.7)	
14 – 20	16 (11.0)	1 (0.7)	
21 – 27	11 (7.5)	(0.0)	
28 and Above	3 (2.1)	1 (0.7)	
Total	139 (95.2)	7 (4.8)	
			0.552
Waitlist			
0 - 6	55 (37.9)	8 (5.5)	
7 - 13	36 (24.8)	4 (2.8)	
14 – 20	27 (18.6)	2 (1.4)	
21 – 27	10 (6.9)	0 (0.0)	
28 and Above	3 (2.1)	0 (0.0)	
Total	131 (90.3)	14 (9.7)	
Training to become a PMV			
Intervention			
Attended training to become a PMV	126 (86.3)	4 (2.7)	
Never attended training to be a PMV	13 (8.9)	3 (2.1)	
			0.438
Total	139 (95.2)	7 (4.8)	
Waitlist			
Attended training to become a PMV	119 (82.1)	14 (9.7)	
Never attended training to be a PMV	12 (8.3)	0 (0.0)	
Total	131 (90.3)	14 (9.7)	

p-value calculated using Chi-square test (χ^2)
*Significant at $p < 0.05$

4.0   Discussion

The wide distribution of the PMV's found within the entirety of the study location makes them easy sources of drugs and other services within the communities (Berendes *et al*., 2012) which further emphasizes that continuous improvement in PMV access to prompt, appropriate and effective services is key to the Global Malaria programmes and strategies (Standing & Bloom, 2002). But the numerous activities of the PMVs usually not considered as risky or unethical, expose an increasing number of clients to so much risks due to the lack of proper knowledge, attitudes or practices exhibited (Yahaya *et al*., 2017; Oyeyemi, *et al*., 2014; Buabeng *et al*., 2010). Going by these facts, the personal factors studied here (age, gender, educational levels, work experiences and training experiences) were expected to exert an over-riding influence on KAP of respondent PMVs, so that having knowledge of these fact will be helpful in efforts towards improving PMVs activities. This strategy is essential to public health efforts in order to effectively fill the manpower gaps existing in malaria treatment and prevention, which for now has been poorly studied and poorly documented (Akuse *et al*., 2010).

Findings from this study shows that only 10 respondents (3.5%) were female, this was not unexpected going by most studies conducted within this study location and this could be due to cultural or religious reasons restricting females from jobs that are exposing to the public. Livinus *et al*., (2009) assessed the impact of training on PMV malaria treatment in a neighbouring northern Nigerian state and they recorded 100% male respondents which corroborates our study findings on gender distribution. But Chukwuocha *et al*., (2013) in their study on knowledge and perceptions of PMVs in a southern Nigerian state, where there is a difference in culture and religion, recorded as much as 32.5% female PMV attendance. Furthermore, Okeke & Uzochukwu (2009) in another study involving training of PMVs in southern Nigeria, recorded female gender composition of 31%. But nonetheless, this study showed that the difference in gender does not significantly influence the KAP of respondents.

The study also showed that there were more respondents within the active working age group of 27-36 years age group, numbering 109 (37.3%), which is in agreement with the study by Okeke *et al*., (2006) where the greater participants were within 30–39 years age group. However, this was in contrast to the study by Chukwuocha *et al*., (2013) where 57.5% of respondents were between 20-29 years. This study also

gave evidence that age differences do not influence the KAP of respondents.

In this study, the number of respondents having a tertiary level education was 21% and those with secondary levels education comprised 54.5% of total respondents, so also the study gave evidence that there is a statistically significant relationship between the knowledge, the attitudes and the practices of respondent PMVs with respect to their acquired educational levels (P <0.001), thus showing evidence that educational attainment greatly influence knowledge, attitudes and practices. The composition of respondent's educational levels is in agreement to the 56.3% secondary and 31.3% tertiary levels education as reported by Chukwuocha *et al*., (2013). But however, Chukwuocha *et al*., (2013) observed that there was no significant relationship between the level of knowledge and the educational attainment, this was a sharp contrast from this study, and could be due to adopting the same attitudinal and practical skills and strategies for treatment and prevention which can be passed down to PMV members. The educational requirements for PMV training are usually not stated in the guidelines for licensing PMVs, though in Nigeria the minimum is primary school certification (Oyeyemi, *et al*., 2014; Ojuawo & Oyaniyi, 1993), which was also noticed in this study. Another setback is that PMVs are known to be from varied backgrounds that can be unconnected to drugs or illnesses (Jimmy *et al*., 2000), by implication this will render successful trainings difficult if not impracticable as it results in varied baseline knowledge levels of PMVs. This fact is also most likely contributing to the poor KAP of PMVs observed by most studies reviewed (Yahaya *et al.,* 2017; Oyeyemi *et al.,* 2014; Buabeng *et al*., 2010; Akuse *et al*., 2010) and this further explains the observation that Pharmacy technicians and registered nurses among the respondent PMVs tend to display more KAP than other colleagues of theirs without medical background.

Working experience of respondents was measured in terms of the years of practice of individual respondents, and this was shown from this present study not to significantly influence KAP of respondents. This observation was also attested by Chukwuocha *et al*., (2013) where he found out that working experience never affected mode and behaviours of practice. The similar observation can be due to the fact that the less experienced PMVs learn and practice what was taught to them by the more experienced PMVs, be it appropriate or otherwise, thereby displaying same pattern of attitudes and practices when relating to treatment patterns.

Although, the knowledge of PMVs was shown by this study to have a statistically significant relationship with having attended a training before becoming PMV ($p = 0.032$), this means the knowledge of respondents is being influenced by the pre-requisite of attending a training before practicing as a PMV. But again, attending a training to become PMV did not significantly influence the attitudes or the practices of respondents just as all other variables tested such as age, gender and working experience had no influence on the knowledge, attitudes or the practices of respondent PMVs.

5.0 Conclusion

The study has highlighted factors that can bring about marked improvements in KAP of PMVs through suitable interventions. Many studies have pointed out gaps in the KAP of respective PMVs in Nigeria and all other malaria endemic regions that permit the operation of PMV activities, but not much has so far been done towards improving the situation. The results obtained from this study showed that an over-riding influence in the KAP of PMVs regarding malaria is achieved with higher educational levels and the establishment of a pre-requisite standardised training for would-be PMV operators.

6.0 Recommendations

Based on the finding from this study, it is recommended that PMVs require training and re-training. Recruitment of PMVs should be standardized to reflect their personal factors which affect their performances as seen in this study, so as to greatly improve their role in malaria management within their communities and the entire sub-region. Governments should be involved in strict policy implementation and training of PMV so as to achieve the goal of eradicating malaria by capitalizing on the established PMV close-to-client infrastructure and their geographical spread across all nooks and corners in sub-Saharan Africa.

Ethical approval:
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and / or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was registered for a further RCT with the Pan African Clinical Trials Registry (South Africa), as stated earlier.
The study was also given due approval by the Ethics and Research Committee of the University Putra Malaysia (JKEUPM) and the National Agency for

Food and Drug Administration and Control (NAFDAC), Yobe State, Nigeria.

Trial Registration*:* Clinical Trials reference number *PACTR201508001215416*. At Pan African Clinical Trials Registry (South Africa).

Consent for publication
All authors have read and approved the final draft of the manuscript.

Availability of data and material
All data generated or analyzed during this study are included in this published article.

Competing interests
The authors declare that they have no competing interests.

References

Abuya, T. O., Fegan, G., Amin, A. A., Akhwale, W. S., Noor, A. M., Snow, R. W., and Marsh, V. (2010). Evaluating different dimensions of programme effectiveness for private medicine retailer malaria control interventions in Kenya. *PLoS One*, 5(1), e8937 S

Akuse, R. M., Eseigbe, E., Ahmed A., and Brieger, W. R., (2010). Patent Medicine Sellers: How can they help control childhood malaria? SAGE-Hindawi Access to research. *Malaria Research and Treatment* Volume, Article ID 470754, 7 pages doi:10.4061/2010/470754

Berendes, S., Adeyemi, O., Oladele, E. A., Oresanya, O. B., Okoh, F., and Valadez, J. J. (2012). Are patent medicine vendors effective agents in malaria control? Using lot quality assurance sampling to assess quality of practice in Jigawa, Nigeria. *PLoS One*, 7(9), e44775.

Buabeng, K. O., Matowe, L. K., Smith, F., Duwiejua, M., and Enlund, H. (2010). Knowledge of medicine outlets' staff and their practices for prevention and management of malaria in Ghana. *Pharmacy world & science*, 32(4), 424-431.

Chukwuocha, U. M., Nwakwuo, G. C., and Mmerole, I. (2013). Artemisinin-based combination therapy: knowledge and perceptions of patent medicine dealers in Owerri Metropolis, Imo

State, Nigeria and implications for compliance with current malaria treatment protocol. *Journal of Community health*, 38(4), 759-765.

FSH, (2008): Future Health Systems: Innovations and knowledge for future health systems for the poor. Policy Brief March, 2008. No: 01 https://www.ids.ac.uk/files/dmfile/fhsPolicy BriefNIGERIAMarch08.pdf

FMH, (2004): Federal Ministry of Health for malaria control in Nigeria: A strategy for behavioural change communication. Abuja: FMOH; 2004.

Livinus C. A., Ibrahim M. O. T., Isezuo S. A., and Bello S. O., (2009). The impact of training on malaria treatment practices: a study of patent medicine vendors in Birnin-Kebbi. *Sahel Medical Journal*. Vol. 12 No.2 April – June, 2009 (58 - 64).

Malaria Consortium: Support to the National Malaria Programme, Nigeria. A DFID-Funded Project: 2008-2012

NPC, (2009). National Population Commission: Nigeria Demographic & Health Survey, 2009. Federal Republic of Nigeria - Abuja, Nigeria.

Ojuawo A, & Oyaniyi O.T., (1993). Treatment of diarrhoea by proprietary- medicine vendors. *Nigerian Journal of Paediatrics*, 20:41-44.

Okeke T.A., and Uzochukwu S.C., (2009). Improving childhood malaria treatment and referral practices by training patent medicine vendors in rural south-east Nigeria. *Malar J*, 8:260.

Okeke, T. A., Benjamin, S. C., & Okafor, H. U. (2006). An indepth study of patent medicine sellers' perspectives on malaria in a rural Nigerian community. *Malaria Journal*, 5, 97.

Onwujekwe, O., Ojukwu, J., Uzochukwu, B., Dike, N., Ikeme, A., and Shu, E. (2005). Where do people from different socio–economic groups receive diagnosis and treatment for presumptive malaria, in south–eastern Nigeria? *Annals of Tropical Medicine & Parasitology*, 99(5), 473-481.

Oyeyemi, A. S., Ogunnowo, B. E., & Odukoya, O. O. (2014). Patent medicine vendors in rural areas of Lagos Nigeria: compliance with regulatory guidelines and implications for

malaria control. *Tropical Journal of Pharmaceutical Research*, 13(1), 163-169.

Rosner, B., (2010) Fundamentals of Biostatistics. Seventh Edition. Harvard University.

Uzochukwu, B. S., Onwujekwe, O. E., Okwuosa, C., & Ibe, O. P. (2014). Patent medicine dealers and irrational use of medicines in children: the economic cost and implications for reducing childhood mortality in Southeast Nigeria. *PLoS One*, 9(3), e91667.

Standing, H., and Bloom, G. (2002). World development report 2003/04. Workshop held at Eynsham Hall, Oxford; 2002. Beyond public and private? Unorganized markets in Health Care Delivery. Prepared and presented at the ''Making Services work for Poor People'', pp. 4–5.

World Health Organization. (2016). World malaria report 2015; Summary. Geneva. Available online: https://www.who.int/publications/i/item/WHO-HTM-GMP-2016.2

World Health Organisation (2023). World malaria report 2022. Online accessed: 06/12/23. Available on: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023

Yahaya M. K., and Halima O. K., (2022). Effectiveness of a concise malaria training program on knowledge, attitudes and practices among patent medicine vendors: A study protocol. *Gadau J Pure Alli Sci,* 1(2): 108-114. https://doi.org/10.54117/gjpas.v1i2.32.

Yahaya M. K., Hayati K. S., and Faisal I., (2017). Effectiveness of Malaria Intervention Programmes among Patent Medicine Vendors: A Systematic Review. *Mal J Med Health Sci* 13(3): 81-91.