GSC Biological and Pharmaceutical Sciences

eISSN: 2581-3250 CODEN (USA): GBPSC2

Cross Ref DOI: 10.30574/gscbps

Journal homepage: https://gsconlinepress.com/journals/gscbps/

(RESEARCH ARTICLE)

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Malaria prevention and treatment awareness and practice among patent medicine vendors (PMVs) in Gombe Metropolis, Nigeria

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GSC Biological and Pharmaceutical Sciences, 2021, 14(03), 113–121

Publication history: Received on 02 February 2021; revised on 01 March 2021; accepted on 03 March 2021

Article DOI: https://doi.org/10.30574/gscbps.2021.14.3.0062

Abstract

The ravaging consequences of Malaria in Sub-Saharan Africa (SSA) have been a subject of serious concern to every stakeholder. Literature and anecdotal evidence shows that around 60% of Nigerians seek fever treatment from Patent Medicine Vendors (PMVs) despite the limited formal dispensing knowledge most possess. This study attempts to establish a base line of knowledge, attitude and practices of Malaria control among PMVs in Gombe Metropolis, North Eastern Nigeria. The study was a descriptive cross sectional survey based on structured questionnaires used to collect relevant information from 109 PMVs selected by purposive sampling technique. The result show that 85.3% of the participants in this study correctly identified fever or high body temperature as the common sign of uncomplicated (UC) Malaria, while 70.6% recognized convulsion as one of the main symptoms of severe Malaria. Furthermore, 86.2% of the PMVs also knew that sleeping inside treated nets constitute one of the best ways to prevent Malaria. In the same vein, awareness of change in Malaria treatment policy from monotherapy to Artemisinin based combination therapy (ACT) was high (73.3%) among them. However, those PMVs that had ever undergone some degree of drug dispensing training exhibited a significantly higher level of awareness of change in malaria treatment policy (X2 =17.903, P = 0.000). Although 85.3% of PMVs frequently recommend Arthemeter Lumefantrine (AL) as treatment of uncomplicated Malaria, only 39.4% of the participants would refer severe malaria cases. Even though most Malaria control awareness and practice variables were found to be fairly good among the participants, it is clear from the study that there is the need for enhanced training, monitoring and supervision by the relevant authorities so as to fully harness the vast potential in PMVs.

Keywords: Malaria; PMVs; Awareness; Diagnosis; Treatment; Prevention

1. Introduction

According to the WHO world Malaria report, an estimated 212 million cases of malaria occur worldwide and 90% malaria cases were in the WHO African Region, with 29% being contributed by Nigeria alone [1]. Global malaria mortality estimate was 429, 000 of which 92% occurred in the WHO African Region, with Nigeria accounting for 26% of the death [1, 2]. Despite some modest achievement recorded in the fight against Malaria 303, 000 malaria deaths were estimated to have occurred in children aged under 5 years, equivalent to 70% of the global total deaths - malaria remains a major killer of children, and is estimated to take the life of a child every 2 minutes [1, 2]. While the healthcare system in the country does present limitations around access to malaria and other communicable diseases, community access to PMVs and essential health-care products are core elements of patient-centred health-care systems which the

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community rely upon especially in places without access to formal health care [2, 3]. The disturbing epidemiological pattern of communicable diseases has resulted in the conceptualization and deployment of so many control efforts including the Public Private Partnership (PPP) model, especially in the African region where communities are worst hit [4,5].

The involvement of Patent Medicine Vendors (PMVs) in the delivery of some form of primary health care and malaria control in developing countries has for some time now been a subject of robust debate and active research [3, 6, 7, 8, 9, 10, 11]. The growing body of evidence points more to the merits than demerits of PMVs involvement in the promotion of access to medicines especially in Low and Middle income countries [3,6,12]. The introduction of global initiatives such as the Affordable Medicines Facility for malaria (AMFm) was viewed as an avenue to explore ways in which PMVs can be utilized as vehicle to help expand coverage for essential health services delivery [3,6,13,14]. However, the apprehension on the use of this medium is around the lack of existing veritable machinery for effective monitoring and quality assurance, and lack of capacity for service delivery considering the fact that the licensing requirement for PMVs has no minimum academic benchmark [15]. This is against the back drop of preponderant cases of fake drugs dispensation by Patent Medicine Shops, lack of adherence to the Pharmaceutical Council of Nigeria stipulated rules of practice for PMVs, rampant cases of inappropriate dispensing and irrational use or dosing of drugs sold by PMVs [2, 16, 17, 18]. The regulation of malaria drug in Nigeria is complex, with several key stakeholders involved. The National Malaria Control Program (NMCP), an organ under the Federal Ministry of Health (FMOH) regulates the scientific basis for recommending appropriate treatment [19]. The National Agency for Food and Drugs Administration and Control (NAFDAC) is charged with testing, approval, registration as well as inspection of drug manufacturing premises and regulations of advertisement of pharmaceutical in country [2, 17,20].

Despite these concerns PMVs accounts for 39% source of malaria treatment in Nigeria [17]. Most people do not obtain appropriate treatment for malaria, and depend on informal private providers for anti-malarial drugs, mainly through patent medicine vendors (PMVs). The picture is similar across sub-Saharan Africa where PMVs are widely used source of drugs for malaria treatment across the continent [3,6,21]. The Nigeria Malaria Indicator Survey, 2010, reported higher estimate (57%) of people in Nigeria that would first call at a PMV store to seek treatment [22]. It has been widely reported that there are several brands of Artemisinin-based combination therapies (ACTs) first-and second-line drug for malaria treatment as recommended by the national treatment guideline in the Nigerian market that are now purchased over the counter [13, 17,20].

In Nigerian context, PMVs are major providers of health care services and most PMVs in Nigeria belong to local affiliates of the National Association of Patent and Proprietary Medicine Dealers (NAPPMED) [23]. As frontline health workers, PMVs perform multiple tasks, including consultation, counseling, treatment and referral of sick clients in medically underserved communities. The operations of PMVs is licensed by the Pharmacy Council of Nigeria to sell patent medicine and in possession of patent and proprietary medicine vendors' license in the form B or C as contained in the Pharmacy Law of Nigeria [3,7]. Under this arrangement PMVs are permitted to sell pre-packaged, over-the-counter (OTC) medicines only, and in addition such licensees are required to be at least 21 years of age and required to complete an apprenticeship training with a more senior PMV [3,10,20,24]. To a certain degree, there is almost nonexistence of evidence of completion of apprenticeship documented within the system. Other PMVs are retired health workers such as pharmacy assistants, nurses, community health workers, and civil servants. To have further insight into the role played by PMVs in the delivery of healthcare in Gombe metropolis the study explores the knowledge, awareness and practice of malaria prevention and management among the PMVs within the area.

2. Material and methods

2.1. Study Setting

Participants were drawn from Gombe metropolis, the state capital of Gombe within the North eastern region of the country. The state borders with Borno, Yobe, Adamawa, Taraba, and Bauchi states, with a land area of 20, 265 SqKm and population of 3,256,962 and around 11.4% are resident within the state capital [25]. The climatic conditions are characterized by a dry season lasting from October to April, while the rainy season lasts between May and September. Climate change, flooding, deforestation, waste management, and mining are emerging health and environmental challenges in the region.

2.2. Study Design and Study Population

An exploratory cross sectional descriptive survey was adopted to measure the participants' knowledge, awareness and practice and any association of their characteristics with malaria drug dispensing. The study population comprises

Patent Medicine Vendors (PMVs) registered with the state chapter of the National Association of Patent and Proprietary Medicine Dealers (NAPPMED) with physical stores or "chemists" within Gombe Metropolis.

As at the time of the data collection a total of 137 PMVs were officially listed on NAPPMED register. Though all (137) were targeted to take part in the study, only 109 of them eventually responded to the questionnaires. The rest either declined or were absent at the times of the data collection.

2.3. Data Collection Instrument and Data Collection

A structured questionnaire comprising 28 items was developed and validated prior to the data collection. The developed questionnaire was first tested among 15 participants outside the sampling area within the metropolis and based on the information generated further adjustments were done on the questionnaire to make it more comprehensible and adopted for the main study. The questionnaire was divided into sections that seek information around participants' socio-demographic data, knowledge of Malaria diagnosis and prevention, practice around Malaria treatment and training/awareness among the PMVs. The data for this work was collected between the months of June and September, 2014; during the monthly coordination meetings of the association (NAPPMED).

2.4. Ethical Considerations

The data collection was done in conjunction with the PMVs association (NAPPMED) officials who were made to understand the significance of the study. That notwithstanding, none of the participants was compelled to participate in the survey such that all was done in compliance with the Helsinki declaration.

2.5. Data Analysis

The data collected was analyzed using Statistical Package for Social Sciences (SPSS) Window Version 16.0 (Chicago, SPSS Inc.) Simple frequency tables, bar charts and cross tabulations were generated and relationships between variables were tested using chi square and Odd Ratio (OR). Associations were considered significant at P-values < 0.05.

3. Results

Table 1 presents socio-demographic characteristics of the participants. The data analyzed show that the participants mean age was 30.41±9.26 years and 88% of the participants age lie between 17 and 40 depicting an active population engaged in the vending trade within the study area. High proportion of the participants (83.2%) were males which shows an under representation of females working in the industry. In addition, 54.1% of the participants were educated only up to secondary school level, leaving 40.4% as having tertiary level education.

Table 1 Socio-demographic data

Variable	Frequency	Percentage (%)	Mean±SD
Age group			
<=20	23	23	
21-30	33	33	30.41±9.2585
31-40	32	32	
>40	12	12	
Sex			
Male	89	83.2	
Female	18	16.8	ditto
Level of Education			
No education	1	0.9	
Primary	5	4.6	ditto
Secondary	59	54.1	
Tertiary	44	40.4	

Table 2 present participants awareness of malaria treatment as enshrined in the national antimalarial treatment guidelines and participants training engagement to upskill their knowledge around the update contained in the guidelines. From the result, 73.3% said they are aware of the treatment changes introduced in the updated guidelines from monotherapy (i.e. Chloroquine, SP) to Artemisinin-based Combination Therapy (ACT) such as Arthemeter Lumefantrine (AL) etc. In addition, only 56.6% of the participants acknowledge ever undergone formal training with malaria component, demonstrating poor knowledge among the participant around the use of national antimalarial treatment guidelines. The table (2) also present the participants' knowledge of common signs and symptoms of malaria for uncomplicated and severe malaria. For uncomplicated malaria, 85.30% of the respondents identified fever or elevated body temperature as the main sign malaria. Bodily pain was the least symptom (0.9%) the participants identified as sign of uncomplicated malaria followed by vomiting (2.8%). When asked of the symptoms of severe malaria 70% participants indicated convulsion, followed by fever/elevated body temperature (21.1%). Other signs and symptoms asked were less likely to be considered when attending to clients.

Table 2 Awareness and signs and symptoms of malaria.

Variable	Frequency	Percentage
Awareness of change in Malaria treatment policy		
Yes	74	73.3
No	27	26.7
Total	101	100
Ever undergone any health care training on Malaria		
Yes	60	56.6
No	46	43.4
Total	106	100
Uncomplicated Malaria (n=109)		
Headache	7	6.4%
Tiredness/Joint or muscle pains	5	4.6%
Loss of appetite	7	6.4%
Body pain/aches	1	0.9%
Vomiting	3	2.8%
Rigors/shivering	4	3.7%
Feeling cold/chills	8	7.3%
Fever/high body temperature	93	85.3%
Severe Malaria (n=109)		
Jaundice or yellowing of the eyes	2	1.8%
Difficulty in breathing	4	3.7%
Severe pallor	4	3.7%
Inability to drink or breastfeed	3	2.8%
Unconsciousness	4	3.7%
Lethargy/Prostration/Generalized body weakness	8	7.3%
Convulsion	77	70.6%
Fever/Elevated temperatures	23	21.1%

Table 3 shows PMVs' exposure to training on malaria and awareness of the new national malaria treatment policy. Majority of the participants (89.5%) that demonstrated awareness of the new treatment policy also indicated having undergone training on malaria treatment based on the new policy. Hence, there were higher (about 8 times) odds (OR = 8.095, 95% CI = CI = 2.8490 – 23.0024) of awareness of the new malaria treatment policy among those exposed to training

than those who were not. This relationship between participants awareness of the new malaria treatment policy and having undergone training on malaria, was statistically significant (X^2 =17.903, df = 1, p = 0.000).

Table 3 PMVs' training and awareness of new antimalarial treatment policy and guideline.

Ever undergone any training on Malaria	**Awareness of new malaria treatment policy and prevention**		
	Yes (%)	No (%)	Total (%)
Yes (%)	51 (89.5)	6 (10.5)	57 (100.0)
No (%)	21 (51.2)	20 (48.8)	41 (100.0)
Total (%)	72 (73.5)	26 (26.5)	98 (100.0)

X2 =17.903, df = 1, P = 0. 000, OR=8.095 CI = 2.8490 – 23.0024

Table 4 shows the anti-malarial drugs (AMDs) commonly dispensed for the treatement of uncomplicated malaria by the participants. Arthemeter Lumefantrine (AL) (85.30%) was the predominant drug dispensed and was closely followed by Sulphadoxine Pyrimethamine (SP) (84.40%) and Artesunate Monotherapy (29.4%) respectively. In case of severe malaria treatment, 39.40% indicated their preferred treatment regime would be to refer the patients to health care facility (hospital) for further management. An appreciable proportion (39.4%) of the PMVs would prescribe Artemisinin Lumefantrine (AL). This was followed by Sulphadoxine Pyrimethamine (SP) where 34.9% said they will consider it as treatment regime for severe malaria.

Table 4 Drugs sold or actions taken by PMVs for malaria Treatment (n=109).

Uncomplicated malaria	***Frequency***
DHA Piperaquine	3.7%
Ateminsinin monotherapy	0.9%
Halofantrine	1.8%
Artemisinin Lumefantrine (AL)	85.3%
Artesunate monotherapy	29.4%
Artesunate Amodiaquine (AA)	1.8%
Sulphadoxine Pyrimethamine (SP)	84.4%
Chloroquine (CQ)	2.8%
Severe malaria	
Refer to hospital	39.4%
Halofantrine	0.9%
Artemisinin Lumefantrine (AL)	39.4%
Artesunate monotherapy	11.9%
Artesunate Amodiaquine (AA)	0.9%
Sulphadoxine Pyrimethamine (SP)	34.9%
Chloroquine (CQ)	0.9%
Quinine	1.8%
Others	0.9%
Malaria preventative approach	
Sleep under insecticide treated nets	86.2%
Use of insecticide spray/IRS	2.8
Improved environmental sanitations	15.6
Erect nets on doors and windows	11.9
Others	0.9

In addition, malaria preventative approach as part of service offered to patients prior to dispensing malaria drugs was assessed. Based on the question asked, 86.2% of participants identified sleeping inside long lasting insecticidal nets (LLINs) or insecticide treated nets (ITNs) as the best way of preventing Malaria. Use of insecticide and other means (i.e. traditional methods) were the least favoured malaria preventive measures considered among the participants.

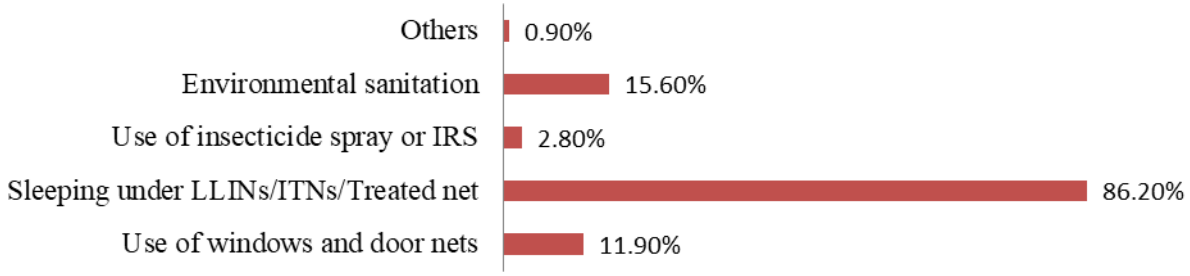

Figure 1 Best ways to prevent Malaria (n=109)

4. Discussion

Participants socio-demographic characteristics is typical of an active sub-population with a mean age of 30.41±9.2585 years with male dominance of 83.2% and more than a half (54.1%) of the PMVs were educated only up to secondary school level. This outcome affirms the fears expressed by many, that the lack of a good benchmark for enrollment into the trade might compromise quality of drug vending and public health [15,24,26,27]. A vast majority of the respondents said their diagnosis of malaria is based on symptoms of which body ache, high temperature, loss of appetite, convulsion etc. are the most frequent symptoms they use to base their conclusion. Overwhelming majority (85.3%) of the PMVs said fever or high body temperature is the main sign of uncomplicated (UC) malaria and convulsion as the major sign (70.6%) of severe malaria. This findings corroborate the conclusion drawn by Goodman et al and Beyeler & Sieverding where high temperature (fever), convulsion, loss of appetite are among the most common symptoms identified PMVs [3,7].

The study revealed Artemisinin Lumefantrine as the most likely malaria treatment to be dispensed among the participants when treating either uncomplicated or severe malaria. Only 39.4% of the participants will consider referral of patients manifesting signs of severe malaria to health facilities (hospital/clinics) for further management. The study also highlighted on the need to enhance training and awareness around the national malaria treatment guidelines to help strengthen capacity among the PMVs considering the vital role they play towards the delivery of primary healthcare especially in areas with limited access to health facilities. While the present study did not assess the content and accuracy of information provided to customers at the point of dispensing malaria treatment, previous studies have demonstrated that PMVs vary widely in the amount, accuracy and quality of information they are likely to provide to their clients [3,24,26,28]. There is also the need to apply caution on the role played by PMVs in the delivery of basic health services as it relates to quality assurance. Previous studies conducted in LMICs including Nigeria has demonstrated poor capacity of PMVs in preventive care, diagnosis and proper dispensing of drugs as well as their engagement in unlicensed practices, trade in substandard and counterfeit antimalarial drugs which have contributed significantly to high burden of malaria and comorbidities in the country [2,20,26,29,30,31]. There is no doubt that addressing this gap will result in fewer hospitalizations and death due to malaria infection in the country.

In addition to dispensing antimalarial drugs, the participants said they provide other advise around malaria prevention of which 86.2% said they encourage sleeping inside insecticide treated nets (ITNs) to prevent malaria infection. This further demonstrates the potential in PMVs for the delivery of some form of Primary Health care interventions [3,7,8,21]. The anti-malarial drugs (AMDs) commonly dispensed for UC Malaria by the participants were mostly Arthemeter Lumefantrine (AL) (85.30%), Sulphadoxine Pyrimethamine (SP) (84.4%) and to minimal extent Artesunate Monotherapy (29.4%). This apparent high rate of dispensing of the nationally recommended ACT/AL as first line AMD may not be unconnected with the continuous awareness creation around ACT subsidy interventions in place by nongovernment organizations (NGOs) that include Society for Family Health (SFH) in the study area. However, what is still considered worrisome is 29.40% of the PMVs who took part in this study affirmed dispensing monotherapies as malaria treatment which leaves gap that still needs to be filled by continuous targeted behavior change communication (BCC) activities. This additionally, re-echoes the call for improvement in performance of PMVs through training especially in Sub-saharan Africa and other LMICs countries [3,30,32,33,34] and our findings show that only 39.40% of

the PMVs in the study area indicated their willingness to always refer clients with symptoms of severe malaria to health facilities for further prognosis cum treatment. Others (39.4%) said they would prescribe AL as first line of treatment followed by those who would dispense SP. This findings is in tandem with other studies conducted in the country where other monotherapies that include SP, quinine etc. were widely prescribed for malaria treatment [11,35]. In these scenarios, drug promotion and clients' demand could have been a key factor on the frequency of each drug being sold to the public.

A good proportion (73.3%) of the PMVs were found to be aware of changes made in the malaria treatment policy from mono-therapy (such as Chloroquine, SP etc) to Artemisinin-based Combination Therapy (ACT) such as Arthemeter Lumefantrine (AL). This could be explained by the scores of capacity building and sensitization activities deployed by government in collaboration with other organizations among the PMVs in the study area. And this is further buttressed by another finding of this study which show that 89.5% of the participants who had undergone training on malaria demonstrated awareness of the new malaria treatment policy and preventive measures. This relationship was found to be very significant (X2 =17.9034, df = 1, P = 0. 000, OR=8.095, CI =2.8490 – 23.0024). The odd ratio (OR) shows that those PMVs who had training on malaria were eight times more likely to be aware of new malaria treatment policy and preventive measures than those who didn't. This finding justifies the continued efforts in making a case for some form of capacity building training for PMVs [3, 7, 8, 36]. This training should be made mandatory as a condition for the renewal of PMVs' license.

5. Conclusion

It is obvious from the foregoing, that high proportions of PMVs in Gombe metropolis know about presumptive malaria diagnosis, prevention and treatment. Notwithstanding, gaps were observed in referral practices and compliance with the new malaria treatment policy. However, since this study also established that trainings were more likely to influence awareness, more could still be done by all stakeholders in the area of training as well as behavior change communication (BCC) activities, and monitoring and supervision of the PMVs.

This study was not without limitations, the sample size of 109 was imposed by the choice of the study area and the limited number of registered PMVs. In addition, the design of the study being cross sectional would mean that generalizations from the findings of the study should be done with caution.

Compliance with ethical standards

Acknowledgments

We acknowledge the cooperation of the state executive committee (EXCO) of the Gombe state Chapter of the PMV association (NAPPMED) who assisted in the data collection.

Disclosure of conflict of interest

The authors submit that there is no conflicting interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

[1] WHO World Malaria Report. 2016.

[2] Liu J, Prach LM, Treleaven E, Hansen M, Anyanti J, Jagha T, Seaman V, Ajumobi O, Isiguzo C. The role of drug vendors in improving basic health-care services in Nigeria. Bulletin of the World Health Organization. 2016; 94(4); 267.

[3] Goodman C, Brieger WR, Unwin A, Mills A, Meek S, Greer G. Medicine Sellers and Malaria Treatment in Sub-Saharan Africa: What Do They Do and How Can Their Practice Be Improved? Am. J. Trop. Med. Hyg. 2007; 77(6_Suppl): 203-218.

[4] AMFm. Affordable Medicine Facility- Malaria. 27 February 2008.

[5] Barnes J, Chandani T, Feeley R. Nigeria Private Sector Health Assessment. Bethesda, MD: Private Sector Partnerships-One project, Abt Associates Inc. 2008.

[6] Wafula FN, Miriti EM, Goodman CA. Examining characteristics, knowledge and regulatory practices of specialized drug shops in Sub-Saharan Africa: a systematic review of the literature. BMC Health Serv Res. 2012; 12: 223.

[7] Beyeler N, Liu J, Sieverding M. A Systematic Review of the Role of Proprietary and Patent Medicine Vendors in Healthcare Provision in Nigeria. PLoS ONE. 2015; 10(1): e0117165.

[8] Akuse RM, Eseigbe EE, Ahmed A, Brieger WR. Patent Medicine Sellers: How Can They Help Control Childhood Malaria? Malaria Research and Treatment. 2010; Article ID 470754 7.

[9] Adikwu MU. Sales practices among PMVs in Nigeria. Health Policy Plan. 1996; 11(2): 202-205.

[10] USAID/PSP-one. Technical report No 10. Nigeria private sector health assessment. 2008; 14-20.

[11] Onwujekwe O, Kaur H, Dike N, Shu E, Uzochuku B, Hanson K, Okoye V, Okonkwo P. Quality of anti-malarial drugs provided by public and private healthcare providers in south-east Nigeria. Malaria Journal. 2009; 8: 22.

[12] Hanson K, Berman P. Private health care provision in developing countries: a preliminary analysis of levels and composition. Health policy and planning. 1998; 13(3): 195-211.

[13] Palafox B, Patouillard E, Touger S, Godman E, Hanson K. ACT watch: evidence for malaria, medicine and policy outlet survey report (baseline), Nigeria. 2009.

[14] The Global Fund to Fight Aids, Tuberculosis and Malaria (GFTAM, 2014). The standard Concept note, Investing for impact against HIV, tuberculosis or malaria. 2014; 6.

[15] Auta A, Omale S, Folorunsho TJ, David S, Banwat SB. Medicine vendors: Self-medication practices and medicine knowledge. North Am J Med Sci. 2012; 4: 24-8.

[16] Okeke TA, Uzochukwu BS, Okafor HU. An in-depth study of patent medicine sellers' perspectives on malaria in a rural Nigerian community. Malaria journal. 2006; 5(1): 1-7.

[17] Oladepo O, Salami KK, Adeoye BW, Oshiname F, Ofi B, Oladepo M, Ogunbemi O, Lawal A, Brieger WR, Bloom G, Peters DH. Malaria treatment and policy in three regions in Nigeria: the role of patent medicine vendors. Future Health Systems. 2007; 1-29.

[18] Oyeyemi AS, Ogunnowo BE, Odukoya OO. Patent Medicine Vendors in Rural Areas of Lagos Nigeria: Compliance with Regulatory Guidelines and Implications for Malaria Control. Trop J of Pharm Res. 2014; 13(1): 163-169.

[19] Federal Republic of Nigeria, National Antimalarial Treatment Policy. Abuja: Federal Ministry of Health. 2005.

[20] Liu J, Isiguzo C, Sieverding M. Differences in malaria care seeking and dispensing outcomes for adults and children attending drug vendors in Nasarawa, Nigeria. Tropical Medicine & International Health. 2015; 20(8): 1081-1092.

[21] Sudhinaraset M, Ingram M, Lofthouse HK, Montagu D. What Is the Role of Informal Healthcare Providers in Developing Countries? A Systematic Review. PLoS ONE. 2013; 8(2): e54978.

[22] National Population Commission (NPC) [Nigeria], National Malaria Control Programme (NMCP) [Nigeria], and ICF International. Nigeria Malaria Indicator Survey 2010. Abuja, Nigeria: NPC, NMCP, and ICF International. 2012.

[23] Ajuwon A, Oshiname F, Imaledo J, Ajayi O. Research and Recommendations on the Delivery of Injectable Contraceptive Services by Patent Medicine Vendors in Rural Nigeria, FHI 360, USAID. 2013.

[24] Brieger WR, Osamor PE, Salami KK, Oladepo O, Otusanya SA. Interactions between patent medicine vendors and customers in urban and rural Nigeria. Health policy and planning. 2004; 19(3): 177-182.

[25] National Bureau of Statistics (NBS). Demographic Statistics Bulletin. 2017.

[26] Oladepo O, Brieger W, Adeoye B, Lawal B, Peters DH. Awareness of anti-malarial policy and malaria treatment practices of patent medicine vendors in three Nigerian states. African journal of medicine and medical sciences. 2011; 40(4): 345-352.

[27] Berendes S, Adeyemi O, Oladele EA, Oresanya OB, Okoh F, et al. Are patent medicine vendors effective agents in malaria control? Using lot quality assurance sampling to assess quality of practice in Jigawa, Nigeria. PloS One. 2012; 7: e44775.

[28] Minzi OMS, Haule AF. Poor knowledge on new malaria treatment guidelines among drug dispensers in private pharmacies in Tanzania: the need for involving the private sector in policy preparations and implementation. East African journal of public health. 2008; 5(2): 117-121.

[29] Almuzaini T, Choonara I, Sammons H. Substandard and counterfeit medicines: a systematic review of the literature. BMJ open. 2013; 3(8).

[30] Beargie SM, Higgins CR, Evans DR, Laing SK, Erim D, Ozawa S. The economic impact of substandard and falsified antimalarial medications in Nigeria. PloS one. 2019; 14(8): e0217910.

[31] Jimmy EO, Achelonu E, Orji S. Antimalarials dispensing pattern by patent medicine dealers in rural settlements in Nigeria. Public Health. 2000 Jul; 114(4): 282-5.

[32] Mills A, Brugha R, Hanson K, Mc Pake B. What can be done about the private health sector in low-income countries? Public Health Reviews, WHO Bulletin of the World Health Organization. 2002; 80(4).

[33] Okeke TA, Uzochukwu BSC. Improving childhood malaria treatment and referral practices by training patent medicine vendors in rural south-east Nigeria. Malar J. 2009; 8: 260.

[34] Livinus C, Ibrahim MO, Isezuo S, Bello SO. The impact of training on malaria treatment practices: a study of patent medicine vendors in Birnin-kebbi. Sahel Med J. 2009; 12.

[35] Bamiselu OF, Ajayi I, Fawole O, Dairo D, Ajumobi O, Oladimeji A, Steven Y. Adherence to malaria diagnosis and treatment guidelines among healthcare workers in Ogun State, Nigeria. BMC Public Health. 2016; 16(1): 1-10.

[36] Ihesie CA, Johnson OE, Motilewa OO, Umoren QM. Factors affecting treatment practices of patent medicine vendors for malaria in under-five children: implications for malaria control in Nigeria. Ghana Med J. 2019; 53(3): 237-247.