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AUTHORS:

Aribodor Dennis Nnanna[1],

Nnabuenyi Success Chidiebere[1],

Aribodor Ogechukwu Benedicta[2],

Ejiofor Obiora Shedrack[3]

Ugwuanyi Ifeoma Kosisochukwu[1]

AFFILIATIONS:

[1]Department of Parasitology and Entomology, Faculty of Biosciences, Nnamdi Azikiwe University, P.M.B. 5025, Awka, Anambra State, Nigeria

[2]Department of Zoology, Faculty of Biosciences, Nnamdi Azikiwe University, P.M.B. 5025, Awka, Anambra State, Nigeria

[3]Department of Pediatrics, Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka, Anambra State, Nigeria

CORRESPONDING AUTHOR DETAILS

Dennis Nnanna Aribodor

Department of Parasitology and Entomology, Faculty of Biosciences, Nnamdi Azikiwe University, P.M.B. 5025, Awka, Anambra State, Nigeria

Email: dn.aribodor@unizik.edu.ng

Short Running Title: Patterns of Malaria Diagnosis among Healthcare facilities in Anambra state, Nigeria

GUARANTOR OF SUBMISSION

Ifeoma Kosisochukwu Ugwuanyi

Department of Parasitology and Entomology, Faculty of Biosciences, Nnamdi Azikiwe University, P.M.B. 5025, Awka, Anambra State, Nigeria

Email: ik.ezugbo-nwobi@unizik.edu.ng

ABSTRACT

Aim

A key component to effective case management of malaria is prompt and accurate diagnosis of the infection. In essence, efficient diagnosis of malaria parasite is very vital for treatment of malaria infection. The present study was designed to evaluate the pattern of malaria diagnosis among healthcare facilities in Awka, Anambra state, Nigeria.

Methods

Pre-tested questionnaires were used to collect information from the selected healthcare facilities-both government and private-owned.

Results

Government-owned hospitals used microscopy (50%) and Rapid Diagnostic Tests (RDT) (50%). Similarly, private-owned hospitals also utilized microscopy (75%) and RDT (25%). The private-owned medical laboratories based their diagnosis on microscopy alone while Patent Medicine Vendors (PMV) utilized clinical or presumptive diagnosis. The study revealed that majority of the healthcare facilities utilized microscopy which is the gold standard in diagnosis of malaria.

Conclusion

Results of this study demonstrated significant difference on pattern of malaria diagnosis between public and private-owned healthcare facilities.

Keywords: Malaria, Diagnosis, Healthcare facilities

INTRODUCTION

Malaria is still the most important parasitic disease of critical health importance worldwide [1]. The burden of mortality, 438,000 deaths in 2015, lies mostly in sub-Saharan Africa countries, with the Democratic Republic of the Congo and Nigeria accounting for more than 35% of the toll [2]. It is a disease of the poor that exacts heavy toll of illness and death especially among children and pregnant mother [3]. Malaria still remains a major public health problem in Nigeria, accounting for 40% of the total malaria cases and death worldwide [4]. In children under five years of age, malaria is responsible for 60% of all outpatient attendances and 30% of all hospital admissions [5]. Nearly 110 million clinical cases and an estimated 300,000 deaths per year, including 11% of maternal mortality, 25% infant mortality and 20% under-five mortality is attributed to malaria [5]. Malaria's economic impact is enormous with about N132 billion lost to malaria annually in form of treatment costs, prevention and loss of man-hours, among other control costs [6]. However, in the last decade there has been a substantial reduction in malaria endemicity in Nigeria, probably as a result of increase in malaria control interventions in the country [6].

A key component to effective case management towards a radical control of malaria is prompt and accurate diagnosis of the infection. This requires clinical assessment by employing various methods for confirmation of malaria prior to treatment with an effective drug. Presently, there is limited number of methods for the diagnosis of malaria. Conventional methods include clinical diagnosis which involves empirical or syndromic diagnosis (mainly the presence of fever in endemic areas) and case history examination. Traditional methods involve the use of light microscope to examine stained peripheral blood smears and other concentration techniques such as Quantitative Buffy Coat (QBC) method. Molecular diagnosis includes Rapid Diagnostic Test (RDT) and serological test which are antibody-based, and Polymerase Chain Reaction. In Nigeria, one of the key factors for treatment failure in malaria is misdiagnosis [1]. Cumulative research evidence over the past years has indicated that effective diagnosis and treatment reduces both morbidity and mortality of malaria [7]. Effective control and subsequent elimination of malaria will no doubt depend on efficient and accurate diagnosis. According to World Health Organization (WHO) [8], prompt and accurate diagnosis is one of the essential components of

malaria control strategies. In line with WHO recommendation, Nigeria, in 2011, updated the National Malaria Treatment Guidelines to reflect universal testing before treatment for suspected cases of malaria [9].

An overarching goal of the National Malaria Strategic Plan 2014–2020 is to test all care-seeking persons with suspected malaria using RDT or microscopy by 2020 [6]. Attainment of this objective deems it necessary that all levels and segments of the Nigerian health system should have access to, and appropriately utilize, malaria diagnostic tools. There is paucity of data on the diagnostic methods for confirmation of malaria cases provided at health facilities in Awka, the capital of Anambra state. Therefore, in this study, we examined the pattern of malaria diagnosis utilized by different healthcare facilities in Awka, Nigeria. It is hoped that findings obtained from this study will provide information about adherence of healthcare providers to the National Malaria Strategic Plan 2014–2020 guideline on malaria diagnosis towards promoting improved diagnosis. The findings obtained from this study will also form basis for making informed choices towards improved malaria diagnosis by healthcare providers in Nigeria and elsewhere. Effective diagnosis will promote treatment of malaria, thereby contributing further to improved malaria management and control.

MATERIALS AND METHODS

Study location and design

This cross-sectional study was conducted in Awka, the capital of Anambra State, southeast Nigeria, between May and July 2016. The geographical coordinates of Awka are Latitude 6^{o}12’25”N and Longitude 7^{o}04’04”E. Awka lies in the tropical rainforest. The climatic condition of the town is characterized by two distinct seasons, wet season (from April to October) and dry season (from November to March). Harmattan winds blow for about four to six weeks between December and January. The temperature in Awka is generally 27-30^{o}C between June and December but rises to 32-34^{o}C between January and April, with the last few months of the dry season marked by intense heat.

According to the last census conducted in Nigeria in 2006, the estimated population of Awka stood at 301,657. Majority of the inhabitants are civil servants, business men and women and students because of presence of a public university in the city. Different healthcare facilities including government-owned hospitals, private-owned hospitals, private-owned medical laboratories and Patent Medicine Vendors (PMVs) abound in Awka. PMVs own and operate drug shop outlets in the private health sector for a profit basis. Very few of these vendors are owned or staffed by formally trained pharmacists. The majority of vendors are owned and staffed by informally trained individuals. All these facilities provide malaria diagnostic services to the residents of Awka and environs.

Study population

Target population included healthcare providers in the public and private health care facilities selected.

Sampling technique and data collection

A total of 15 healthcare facilities participated in the qualitative data collection. According to information obtained from Anambra State Ministry of Health, there are 150 different healthcare facilities in Awka area. Ten percent (10%) of each group were then randomly chosen. Therefore, a total of 15 health facilities made up of 6 PMVs, 2 government-owned hospitals, 4 private-owned hospitals and 3 private-owned laboratories, were studied. A pre-tested semi-structured questionnaire was issued to a randomly chosen eligible healthcare worker in each facility. An eligible worker was one who offered malaria diagnosis in the facility. The questionnaire obtained information on respondent's socio-demographics characteristics, years of experience and method(s) of malaria diagnosis.

Ethical Clearance

Ethical clearance was obtained from the Ethics committees of Anambra state University Teaching Hospital, Awka, Anambra State, Nigeria.

Statistical analysis

Comparison of diagnostic methods among the different healthcare facilities was carried out using the Chi square test. Frequency tables and charts were used for data presentation. Data analysis was done using statistical package for social science (SPSS) version 21. For all the statistical analysis, the level of significance was set at $p<0.05$, 95 % CI.

RESULTS

A total of 15 health facilities made up of 6 PMVs, 2 government-owned hospitals, 4 private-owned hospitals and 3 private-owned laboratories, were studied as shown in Table 1.

Of the 6 PMV healthcare workers, only 2 were managed by qualified pharmacists while the rest had no appropriate qualification. The 3 healthcare workers in the private-owned laboratories were qualified laboratory scientists. Similarly, the 4 healthcare workers in the private-owned hospitals were also qualified laboratory scientists. Of the 2 healthcare workers in the government-owned hospitals, 1 was a qualified laboratory scientist while the other was a health assistant (Table 2).

The diagnostic methods used by healthcare facilities showed that all the PMVs were using symptom-based presumptive method of diagnosis, all the private laboratories were using microscopic method of diagnosis, private hospitals were using 75% microscopy and 25% RDT, and government owned hospitals were using 50% microscopy and 50% RDT (Figure 1).

DISCUSSION

The study demonstrated significant difference on pattern of malaria diagnosis between public and private-owned healthcare facilities. Microscopy was the most utilized diagnostic method by healthcare facilities in the study. This may be connected with the fact that it is the gold standard for malaria diagnosis and as such its adherence by many healthcare facilities. Malaria RDT kits were more available in government-owned health facilities (50%) and also were its utilization for parasitological confirmation of malaria infection. In the private-owned healthcare facilities, it was only available in few private-owned hospitals (25%). This is in

agreement to a study done in Ogun state Nigeria which revealed that RDT kits were more available in the public health facilities (82.0 %) than private health facilities (19.2 %) [10]. At present, there is free supply of RDT kits to public-owned health facilities by the state government. Therefore, this may have accounted for its abundance and use in the public-owned hospitals. Moreover, the RDT kits may be unaffordable to most of the private-owned healthcare facilities, and this may have prompted them to rely more on presumptive diagnosis and microscopy. This finding underscores the necessity to scale-up RDT usage as well as microscopy among most private-owned health facilities in a view to discourage reliance on presumptive diagnosis. The cost of RDTs can be made affordable by interventions from the government and non-profit organizations considering its advantage of prompt diagnosis of malaria towards an effective malaria infection management.

All the PMVs utilized symptom-based presumptive method of diagnosis. It is known that in sub-Saharan Africa [11-15], PMVs are important caregivers for treatment of uncomplicated malaria. The practice of symptom-based presumptive diagnosis among this group of care providers is quite common in Nigeria [15]. Since shortcomings of presumptive diagnosis such as improper and abusive use of anti-malaria drugs which encourages anti-malarial drug resistance are well documented [16,17], this may imply failure of the PMVs to identify and treat malaria appropriately [18] and as such may result in the irrational use of anti-malarial drugs [19]. The National Malaria Strategic Plan 2014–2020 [6] specified that timely parasite-based diagnosis of malaria should be performed prior to treatment. Since PMVs serve a major number of malaria treatment seekers, standard diagnostic testing prior to treatment should be implemented as part of a concerted strategy for improved malaria treatment and control. PMVs and treatment seekers therefore require appropriate education for behavioural change, so they can seek to use better diagnostic methods rather than relying on only symptom-based presumptive diagnosis.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHOR'S CONTRIBUTIONS

Dennis Nnanna Aribodor

Group1 - Conception and design, Acquisition of data, Analysis and interpretation of data

Group 2 - Drafting the article, Critical revision of the article

Group 3 - Final approval of the version to be published

Success Chidiebere Nnabuenyi

Group1 - Conception and design, Acquisition of data, Analysis and interpretation of data

Group 2 - Drafting the article, Critical revision of the article

Group 3 - Final approval of the version to be published

Ogechukwu Benedicta Aribodor

Group1 - Acquisition of data, Analysis and interpretation of data

Group 2 - Critical revision of the article

Group 3 - Final approval of the version to be published

Obiora Shedrack Ejiofor

Group1 - Acquisition of data, Analysis and interpretation of data

Group 2 - Critical revision of the article

Group 3 - Final approval of the version to be published

Ifeoma Kosisochukwu Ugwuanyi

Group1 - Acquisition of data, Analysis and interpretation of data

Group 2 - Drafting the article, Critical revision of the article

Group 3 - Final approval of the version to be published

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TABLES

Table 1: Selection of healthcare facilities included in the study

Healthcare facilities	Total	Number selected
Patent medicine ventures (PMV)	60	6
Government hospital	20	2
Private hospital	40	4
Private laboratories	30	3
Grand total	150	15

Table 2: Socio-demographic characteristics of healthcare workers

Healthcare facility	S/N	Years of Experience	Sex	Age (years)	Cadre of health worker
Patent Medicine Vendor (PMV)	1	5	M	31-40	None
	2	10	M	41-50	None
	3	3	F	21-30	Pharmacist
	4	4	M	21-30	None
	5	7	M	31-40	Pharmacist
	6	9	M	31-40	None
Private-owned Laboratory	7	6	F	31-40	Laboratory scientist
	8	10	M	41-50	Laboratory scientist
	9	14	F	31-40	Laboratory scientist
					Laboratory scientist
Private-owned hospitals	10	2	F	21-30	Laboratory scientist
	11	5	M	31-40	Laboratory scientist
	12	7	M	31-40	Laboratory scientist
	13	11	F	41-50	Laboratory scientist
Government-owned hospitals	14	4	F	31-40	Laboratory scientist
	15	9	F	41-50	Health Assistant

FIGURE LEGEND

Figure 1: Malaria diagnostic methods used in healthcare facilities studied.

FIGURE

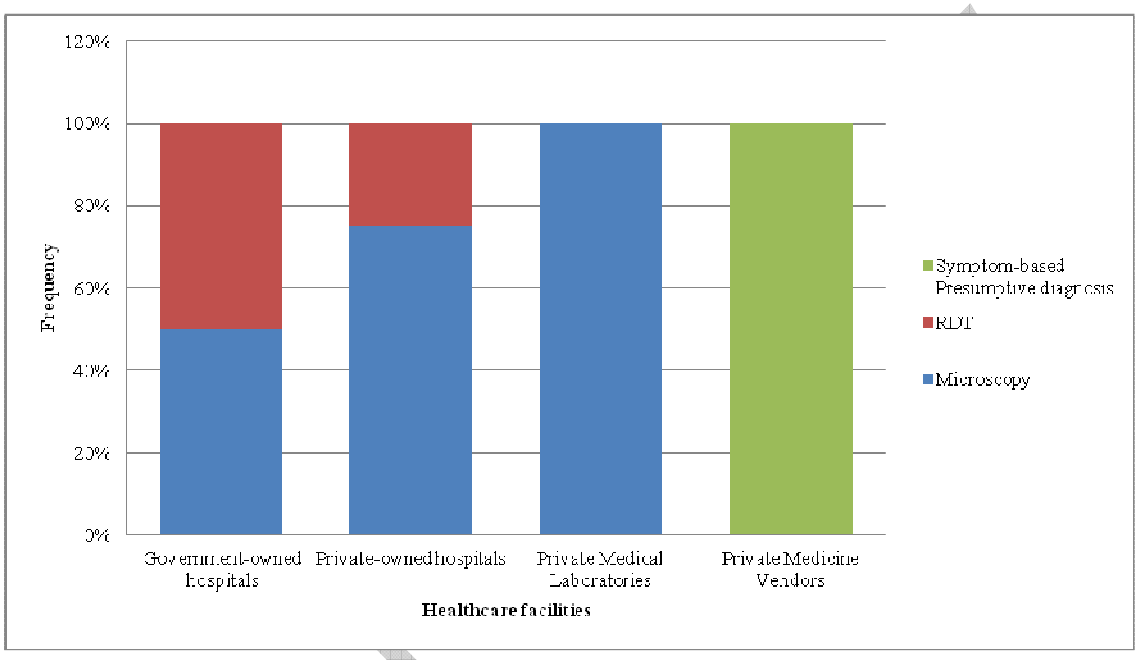

Figure 2: Malaria diagnostic methods used in healthcare facilities studied.