

Malaria Diagnosis and Treatment: Perception of Community Pharmacists in Abuja Metropolis, Nigeria

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Abstract: Malaria is a life threatening infectious disease that constitutes a major global public health and economic concern. Consequently, the WHO has recommended a T3 initiative (Test, Treat & Track) to help curb the scourge globally. This study aimed to ascertain the efficacy of malaria diagnosis in malaria case management and perception of community pharmacists on the WHO recommended standard of parasitological diagnosis before commencement of treatment within Abuja metropolis. A descriptive cross sectional study was performed amongst 207 community pharmacists within Abuja Metropolis. Data was obtained through structured, self-administered questionnaire. The association of respondent characteristics with the awareness, practice, and perception of malaria testing, and treatment was evaluated by Chi-square analysis for proportion. Where the number of categories was less than five, Fisher exact test was used. Seventy-two percent (72.9%) were aware of the WHO recommended T3 initiative on malaria case management. However, less than 10% of respondents had training in all the three components. On practice, 28.5% of community pharmacists carry out malaria diagnosis with a confirmatory test before instituting treatment. Ninety-two percent (92.3%) treat malaria based on clinical signs and symptoms only. Despite the high rate of clinical diagnosis, a majority (84.1%) agreed that the confirmatory test is more effective and efficient in malaria case management than clinical diagnosis. Most respondents (60.4%) reported that the confirmatory test most readily available was mRDT. Eighty-seven percent (87%) have good perception on parasitological confirmatory testing for malaria diagnosis and most respondents have confidence in results from the malaria confirmatory test while 68.6% trust their malaria confirmatory test skill. A little above half (52.7%) of the respondents treat for malaria regardless of negative confirmatory test results when the patient insists on treatment. A higher proportion (39%) of male community Pharmacists compared to females carry out malaria diagnosis with a confirmatory test before treatment. There was significant association of perception on the efficacy of a parasitological confirmatory test for malaria with age and work experience and there was significant association of work experience with the practice of confirmatory testing before treatment ($P < 0.05$). Inferentially, this is call to action for government, professional bodies in the health sector and all committed to fight the scourge of malaria for more awareness to the general public on importance of the WHO T3 and capacity strengthening for the frontline health workers – community pharmacy attending to community needs on malaria case management.

Keywords: Malaria, WHO T3, Attitude, Practice, Perception

1. Introduction

Malaria is a life-threatening infectious disease that constitutes a major global public health and economic concern. It is a parasitic infection of the red blood cells transmitted to humans through the bite of infected female *Anopheles* mosquitoes [1]. It is caused by five different species of *Plasmodium*, namely, *P. falciparum*, *P. vivax*, *P. malariae*, *P. knowlesi*, and *P. ovale*. Amongst the five, *P. falciparum* and *P. vivax* pose the greatest health threat [2]. In 2018, malaria cases were estimated 228 million worldwide and an estimated number of malaria deaths stood at 405 000 in 2018. Approximately 106 countries are at risk of transmission of malaria in the world. African Region accounted for 93% (213 million) of the malaria cases. Six countries accounted for more than half of all malaria cases worldwide: Nigeria (25%), the Democratic Republic of the Congo (12%), Uganda (5%), and Côte d'Ivoire, Mozambique and Niger (4% each) [3]. Nigeria is a malaria endemic country and accounts for the greater percentage of the world's malaria burden and death. In Nigeria, malaria cases accounts for 30% of all hospital admissions and about 60% of all out-patient visits. Annually, about 50% of Nigerian populations suffer at least one episode of malaria. Malaria is amongst the leading causes of children under-five morbidity and mortality which contributes to 30% of children under five and 25% infant mortality. The economic impact of malaria approximates to an annual loss of 132 billion naira in cost of treatment of malaria [4]. This can be measurably reduced if the WHO/ national guidelines on malaria treatment is strictly adhered in performing parasitological testing before appropriate use of artemisinin combination therapy (ACT) for positive cases only.

A great deal of work has been done towards the elimination of malaria across the globe ranging from vector control (use of insecticide-treated mosquito), sulphadoxine-pyrimethamine intermittent prophylactic treatment in pregnant mothers yet the malaria scourge has remained a fight to be won especially in Nigeria. The diagnosis of malaria can be by clinical (presumptive) diagnosis, microscopy and rapid diagnostic testing (RDT). Clinical diagnosis is a presumptive method in which treatment of malaria is based on signs and symptoms presented by the patient. It is commonly used due to the fact that it is cheap, rapid in diagnosing, and useful in locations where laboratories are not accessible. Clinical diagnosis suffers the limitation of possible over diagnosis and misdiagnosis of malaria. The microscopy method is the gold standard for malaria diagnosis and involves the use of Giemsa-stained blood sample smear to microscopically detect *Plasmodium* infected blood cells. This method allows for the detection of infection at asymptomatic and symptomatic stages but drawbacks of cost and technical expertise required to perform. Rapid diagnostic testing involves use of test strips impregnated with monoclonal antibodies to detect targeted antigens in an immunochromatographic assay. RDT is the

mainstay of malaria diagnosis in resources constrained areas as minimal cost, technical expertise to perform and interpret test, laboratory equipment is not required. The sensitivity of RDT testing is affected by some factors such as storage condition, temperature, humidity and time of the assay [5]. Incessant and undiagnosed use of available antimalarial medicines has led to the emergence of resistant strains of the *Plasmodium* parasite, over diagnosis, misdiagnosis and abuse of medicines. The place of screening and diagnosis before treatment of malaria cases cannot be overemphasized hence, in 2010, the World Health Organization (WHO) recommends that all persons of all ages in all epidemiological settings with suspected malaria should receive a parasitological confirmation of diagnosis before commencing treatment [6]. This birthed the shift from presumptive treatment to test based treatment to curb over diagnosis, misdiagnosis and drug resistance issues. Many countries have aligned their malaria case management to the WHO standard of a blood parasitological test before commencement of treatment especially in the public health facilities.

In the public sector, a huge increase in malaria diagnostics has been recorded from less than 10 to over 60% between 2000 and 2013 in the WHO African Region. However, in the private sector, uptake of malaria diagnostics has remained at much lower levels [7]. In Nigeria just like in most African country, more than 60% of the population seeks for malaria treatment in private owned drug shops community pharmacies and 29% proprietary patent medicine vendors) to cut on cost and time spent on waiting for consultation in government or private owned health facilities [8]. Despite the proven effectiveness of malaria diagnosis in malaria case management, community pharmacists still dispense or prescribe antimalarial drugs for patients without malaria diagnosis which could be largely due to their perception on reliability & accuracy of diagnosis, cost of diagnosis, lack of knowledge on malaria case management policy and guideline, knowledge of causes of fever, patient expectation [9]. This has resulted in over diagnosis, misdiagnosis, under-diagnosis and increased economic burden as more money are spent on treatment of undiagnosed malaria. The emergence of resistant strains of the *plasmodium* parasite to available artemisinin based combination therapy has further placed financial strain on the economy [10]. The aim of this study was to ascertain the efficacy of malaria diagnosis in malaria case management and perception of community pharmacists on the WHO recommended standard of parasitological diagnosis before commencement of treatment within Abuja metropolis.

2. Method

This study was a cross sectional descriptive study, conducted amongst community pharmacists in Abuja Metropolis through the Association of Community Pharmacists' of Nigeria (ACPN) Abuja Chapter. The ACPN is a technical arm of Pharmaceutical Society of Nigeria (PSN) committed to the empowerment of every community

pharmacist to embrace best pharmacy practice and collaborate with all Stakeholders in the health sector to protect and promote quality healthcare delivery. ACPN activities include Drug Information Service, Advocacy, Capacity building, Members' protection and welfare (ACPN National Secretariat) [11]. The procedure for malaria case management including diagnostic testing and perception to WHO "test, treat& track (TTT)" mandate was evaluated amongst ACPN members.

A structured self-administered questionnaire was used to collect data in which answers were provided. The questionnaires were administered electronically to individual respondents. The questionnaire consisted of all the study variables. The questionnaire had four sections. Section A comprising of questions on the respondents' demographic data and section B questions on malaria diagnosis in use for malaria case management and section C and D on attitude and practice of community pharmacist towards malaria diagnosis in malaria case management, respectively.

Ethical approval was obtained from the Association of Community Pharmacists of Nigeria, Abuja Chapter and Pharmaceutical Society of Nigeria Abuja Chapter. Each Participant was informed in writing, with full explanation of the content of the questionnaire and the purpose of the study. They were assured the confidentiality of whatever information given by them for the study.

Collected data was analyzed using SPSS software. Descriptive statistics were used to summarize data into

frequencies, graphs and tables. Chi-square was used to test for association between various socio-demographic variables and the attitude and practice of the community pharmacist towards malaria diagnosis in case management.

3. Results

Section A: Socio-demographic characteristics of participants

The study sample had slightly more male respondents than females, and most respondents (above 80%) were young adults below the age of 40 years. More than half of the respondents were single, and the majority reported Christianity as their religion. The highest qualification for the majority (above 70%) of the respondents was the first degree, while the work-related experience was less than 10 years for most (about 80%) respondents.

Section B: Community Pharmacists awareness and training on malaria case management

The level of awareness and training of community pharmacists on malaria case management is reflected in Table 2. Most of the respondents (72.9%) indicated that they were aware of the WHO recommended T3 (Test (diagnosis), Treat (ACT) & Track (Reporting)) initiative on malaria case management. Those who indicated that they had been trained in malaria case management were in the majority (67%). In all, 9% of respondents had training in all the three components of the WHO T3 initiative on malaria case management.

Table 1. Socio-demographic characteristics of participants.

Characteristics	Sub-group	Frequency	Percent
Sex	Female	94	45.4
	Male	112	54.1
	Not indicated	1	.5
Age	less than 30 years	90	43.5
	30 - 39 years	87	42.0
	40 - 49 years	21	10.1
	greater or equal to 50years	9	4.3
Marital status	Married	97	46.9
	Single	110	53.1
Religion	Christianity	165	79.7
	Islamic	42	20.3
Highest educational qualification	Graduate Degree	149	72.0
	Postgraduate Degree	58	28.0
Years of experience	less than 10years	166	80.2
	10 - 19 years	27	13.0
	20 -29 years	9	4.3
	greater or equal to 30years	5	2.4

Table 2. Community Pharmacists awareness and training on malaria case management.

Assessment question	Response	Frequency	Percent (%)
Knowledge of the WHO recommended T3 initiative	No	56	27.1
	Yes*	151	72.9
Trained in malaria case management	No	67	32.4
	Yes*	138	66.7

Trained in Malaria Case Management

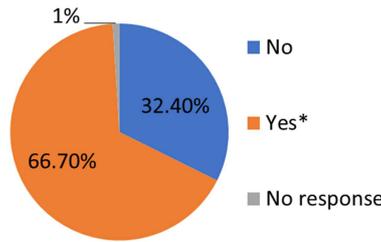


Figure 1. Trained in Malaria Case Management.

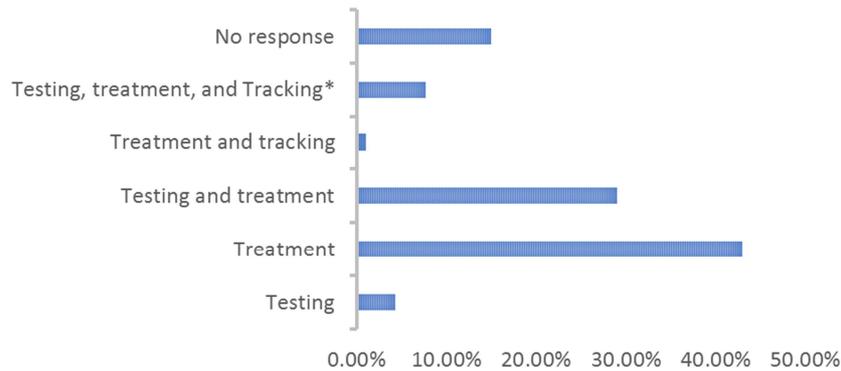


Figure 2. Training on WHO T3 Components.

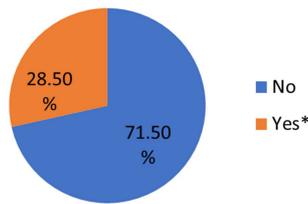


Figure 3. Do you perform confirmatory test before treatment?

Treatment of Malaria based on Clinical diagnosis

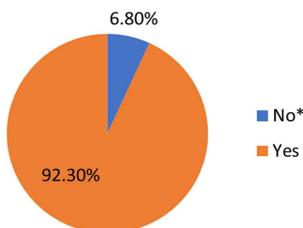


Figure 4. Do you treat malaria based on clinical diagnosis?

Section C: Community Pharmacists practice of and attitude to Malaria diagnosis

The assessment of practice and perception of community pharmacists concerning malaria diagnosis indicated that less than one-third of community pharmacists carry out malaria diagnosis with a confirmatory test before commencing treatment. Malaria Rapid Diagnostic Test (mRDT) and a combination of mRDT and microscopy were the most common confirmatory test carried out. Almost all the respondents (about 92.3%) indicated that they treat malaria based on clinical signs and symptoms only. Despite the high rate of clinical diagnosis, a majority (about 82.1%) agreed

that the confirmatory test is more effective and efficient in malaria case management than clinical diagnosis. Most respondents (about 60.4%) reported that the confirmatory test most readily available was mRDT.

Performance of Confirmatory Test before Treatment

Section D: Perception of Community Pharmacists on Malaria diagnosis

The perception of community pharmacists towards malaria diagnosis suggests that most community pharmacists (more than 87%) do not believe that clinical signs and symptoms only are sufficient in confirming malaria diagnosis, and for treatment initiation. Also, a majority (above 82.6%) of respondents agreed that a confirmatory test was sufficient in detecting the plasmodium parasite in suspected malaria, and agreed on the need to perform a confirmatory test on suspected malaria cases before treatment. Furthermore, most respondents (86%) stated that they have confidence in results from the malaria confirmatory test. However, those that indicated that they trust their skills in performing malaria test were less than 70%. Slightly above half (52.7%) of the respondents stated that they would treat for malaria regardless of negative confirmatory test results when the patient insists on treatment.

Need to Perform Malaria Confirmatory testing.

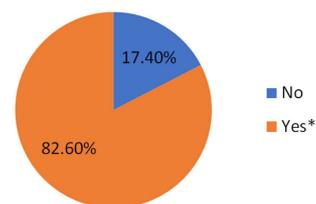


Figure 5. Is there need to perform confirmatory test on suspected malaria case before treatment?

Confidence in Malaria Confirmatory Test Results

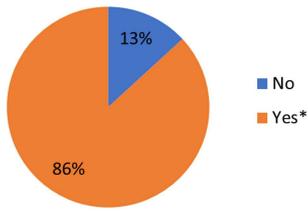


Figure 6. Do you have confidence in malaria confirmatory test results?

Malaria Treatment regardless of Negative Confirmatory Result

Section E: Association of respondents' characteristics with their practice of and opinion on Malaria diagnosis

Table 3 shows that there were no gender or age-related differences in the opinion of community pharmacists regarding the importance of malaria diagnosis in malaria case management. Similarly, the opinion did not differ

significantly between married and unmarried respondents, Christians and Muslims, respondents with graduate and postgraduate qualifications, and between those with less than ten years' work-related experience and those with more years of experience. Additionally, awareness and training in the WHO T3 initiative on malaria case management did not result in a significant difference in the opinion of community pharmacists regarding the importance of malaria diagnosis in malaria case management ($p < 0.05$).

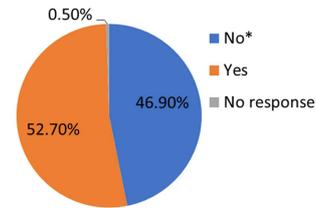


Figure 7. Do you treat for malaria regardless of negative confirmatory test results when the patient insists on treatment?

Table 3. Chi Square analysis showing association between socio-demographic characteristics and importance of malaria test before diagnosis.

Respondents characteristics	Response		Chi-square	P value
	No (%)	Yes (%)		
Sex				
Female	10.64	84	3.257	0.071
Male	19.82	89		
Age (Years)				
Less than 30 years	11.24	88.76	2.25	0.325
30-39	18.39	81.61		
40 and above	20	80		
Marital status				
Married	16.49	83.51	0.129	0.719
Single	14.68	85.32		
Level of Education				
Graduate	15.54	84.46	0	0.997
Post Graduate	15.52	84.48		
Religion				
Christianity	13.41	86.59	2.754	
Islamic	23.81	76.19		
Years of experience				
Less than 10 years	13.94	86.06	1.607	0.205
10 and above	21.95	78.05		
Knowledge of WHO recommended T3 initiative				
No	23.64	76.36	3.754	0.053
Yes	12.58	87.42		
Trained in malaria case management				
No	18.18	81.82	0.459	0.498
Yes	14.49	85.51		
Trained in malaria Testing				
No	20.88	79.12	2.653	0.103
Yes	11.76	88.24		

Association between respondents' characteristics and practice of WHO T3 components

A significantly higher proportion (88.24%) of those who had received Training in testing practiced all three components (Testing, treatment, and tracking) of the WHO T3 initiative on malaria case management (Table 6). Other respondents' characteristics were not significantly associated with the practice of all the three components of the WHO T3 initiative on malaria case management.

Table 4. Association between respondents' characteristics and practice of WHO T3 components.

Respondent's characteristics	Response		Chi-square	P value
	One or two (%)	All three (%)		
Sex				
Female	97.87	2.13	2.079	0.149
Male	93.75	6.25		
Age				
less than 30	96.67	3.33	0.707	0.702
30 – 39	94.25	5.75		
40 and above	96.67	3.33		
Marital status				
Married	95.88	4.12	0.022	0.882
Single	95.45	4.55		
Level of education				
Graduate	97.32	2.68	3.537	0.06
Post Graduate	91.38	8.62		
Religion				
Christianity	96.36	3.64	0.99	0.32
Islamic	92.86	7.14		
Years of experience				
Less than 10	95.18	4.82	0.448	0.503
10 and above	7.56	2.44		
Knowledge of WHO recommended T3 initiative				
No	98.21	1.79	0.271	0.271
Yes	94.7	5.3		
Trained on malaria case management				
No	95.52	4.48	0.002	
Yes	95.65	4.35		
Trained on malaria Testing				
No	100	0	0.003*	
Yes	90.59	9.41		

Table 5. Association between respondents' characteristics and the practices of confirmatory malaria diagnosis before treatment initiation.

Respondent's characteristics	Response		Chi-square	P value
	No (%)	Yes (%)		
Sex				
Female	79.79	20.21	5.392	0.02**
Male	65.18	34.82		
Age				
Less than 30 years	71.11	28.89	0.059	0.971
30 – 39	71.26	28.74		
40 and above	73.33	26.67		
Marital status				
Married	74.23	25.77	0.667	0.414
Single	69.09	30.91		
Level of Education				
Graduate	73.15	26.85	0.716	0.397
Post graduate	67.24	32.76		
Religion				
Christianity	73.33	26.67	1.345	0.246
Islamic	64.29	35.71		
Years of experience				
Less than 10years	71.08	8.92	0.07	0.791
10 and above	73.17	26.83		
Knowledge of WHO recommended T3 initiative				
No	89.29	10.71	11.92	0.001**
Yes	64.9	35.1		
Trained on malaria case management				
No	77.61	22.39	1.984	0.159
Yes	68.12	31.88		
Trained on malaria Testing				
No	75.82	24.18	4.389	0.036**
Yes	61.18	38.82		

Association between respondents' characteristics and the practices of confirmatory malaria diagnosis before treatment initiation

Table 5 shows that a higher proportion of male community Pharmacists compared to females carry out malaria diagnosis with a confirmatory test before treatment. In addition, a significantly higher proportion (35.1%) of those who know about the WHO recommended T3 initiative on malaria case management as well as those who had received training on malaria testing (33%) reported carrying out malaria diagnosis with a confirmatory test before treatment when compared to those who are not aware and have not been trained ($p < 0.05$).

Section F: Factors associated with the perception of

Table 6. Association of respondents' characteristics with the perception of the effectiveness and efficiency of the confirmatory test compared to clinical diagnosis in malaria case management.

Respondent's characteristic	Response		Chi-square	P value
	No (%)	Yes* (%)		
Sex				
Female	15.05	84.95	0.04	0.842
Male	16.07	83.93		
Age (Years)				
Less than 30	7.78	92.22	12.256	0.002**
30-39	17.24	82.76		
40 and above	34.48	65.72		
Marital status				
Married	17.71	82.29	0.648	0.421
Single	13.64	86.36		
Level of Education				
Graduate	14.09	85.91	0.851	0.356
Post graduate	19.3	80.7		
Religion				
Christianity	15.24	84.76	0.052	0.82
Islamic	16.67	83.33		
Years of experience				
Less than 10	10.84	89.16	14.335	<0.001**
10 and above	35	65		
Knowledge of WHO recommended initiative				
No	17.86	82.14	0.316	0.574
Yes	14.67	85.33		
Trained on malaria case management				
No	16.42	83.58	0.04	0.841
Yes	15.33	84.67		
Trained in malaria testing				
No	21.11	78.89	2.762	0.097
Yes	11.76	88.24		

Association between respondents' characteristics and confidence in results from the malaria confirmatory test

There was no gender, age, marital status, and religious affiliation related association in the confidence of respondents regarding malaria test results. Also, work experience and training in the WHO T3 initiative on malaria case management did not result in a significant difference in the confidence community pharmacists have in the results of malaria confirmatory test (Table 7).

Association between respondents' characteristics and respondent's confidence in performing malaria confirmatory

community pharmacists on malaria diagnosis

The results summarized in Table 6 indicates perception of confirmatory test (parasitological testing) to be more effective and efficient in malaria diagnosis than clinical diagnosis was higher among younger Pharmacists those aged <30 years (92.22%), followed by those aged 30-39 (82.76%), compared to those aged 40 years and above (65.52%). Similarly, a significantly higher proportion of those with less than 10 years' work-related experience compared to those with more work experience had the perception that a confirmatory test was more effective and efficient in malaria case management than clinical diagnosis.

test

The confidence of community Pharmacists to perform a malaria confirmatory test is shown in Table 8. More males compared with females, and those aware of the WHO T3 initiative on malaria case management compared to those not aware have more confidence in their skills to perform malaria confirmatory test. Similarly, those trained in malaria case management compared to those not trained, as well as those who had training in malaria testing compared with those not trained reported that they have more confidence to perform malaria confirmatory test.

Table 7. Association between respondents' characteristics and confidence in results from the malaria confirmatory test.

Respondent's characteristics	Response		Chi-square	P value
	No (%)	Yes (%)		
Sex				
Female	14.89	85.11	0.417	0.518
Male	11.82	88.18		
Age (years)				
Less than 30	13.33	86.67	0.601	0.74
30-39	11.63	88.37		
40 and above	17.24	82.76		
Marital status				
Married	13.68	86.32	0.041	0.84
Single	12.73	87.27		
Level of education				
Graduate	15.65	84.35	2.784	0.095
Postgraduate	6.9	93.1		
Religion				
Christianity	12.27	87.73	0.565	0.452
Islamic	16.67	83.33		
Years of experience				
Less than 10	12.12	87.88	0.814	0.367
10 and above	17.5	82.5		
Knowledge of WHO recommended T3 initiative				
No	17.86	82.14	1.48	0.224
Yes	11.41	88.59		
Trained in malaria case management				
No	16.67	83.33	0.961	0.327
Yes	11.68	88.32		
Trained in malaria Testing				
No	11.11	88.89	0.137	0.711
Yes	9.41	90.59		

Table 8. Association between respondents' characteristics and respondent's confidence in performing malaria confirmatory test.

Respondent's characteristics	Response		Chi-square	P value
	No (%)	Yes*(%)		
Sex				
Female	36.67	63.33	6.105	0.013**
Male	20.75	79.25		
Age (Years)				
Less than 30	25.58	74.42	0.415	0.813
30-39	29.76	70.24		
40 and above	29.63	70.37		
Marital status				
Married	25.27	74.73	0.588	0.443
Single	30.19	69.81		
Levels of education				
Graduate	29.29	70.71	0.449	0.053
Postgraduate	24.56	75.44		
Religion				
Christianity	30.32	69.68	2.087	0.149
Islamic	19.05	80.95		
Years of experience				
Less than 10	26.25	73.75	1.179	0.278
10 and above	35.14	64.86		
Knowledge of WHO recommended T3 initiative				
No	45.28	54.72	10.864	0.001**
Yes	21.53	78.47		
Trained in malaria case management				
No	38.46	61.54	5.065	0.024**
Yes	23.08	76.92		
Trained in malaria Testing				
No	42.35	57.65	19.02	<0.001*
Yes	12.2	72		

4. Discussion

The study sample had slightly more male respondents than females, and most respondents (above 80%) were young adults below the age of 40 years. The highest qualification for the majority (above 70%) of the respondents was the first degree, while the work-related experience was less than 10 years for most (about 80%) respondents, this is supported by a study done by Kanayo Patrick Osemene and Wilson O Erhun [12] in which there were more male than females within the age 18-34 years in community pharmacies. More than half of the respondents were married, and the majority reported Christianity as their religion. The long work hours and demanding nature of community pharmacy may explain why there are more young (below 40 years) male than female pharmacists in community pharmacies.

More than half of the respondents (72.9%) indicated that they were aware of the WHO recommended T3 (Test (diagnosis), Treat (ACT) & Track (Reporting)) initiative on malaria case management. Those who indicated that they had been trained in malaria case management were in the majority (67%). This number falls within the number that have received training on one or two WHO T3 initiative commonly on testing. In all, only 9% of respondents had training in all the three components of the WHO T3 initiative on malaria case management. The study by Ndibuagu *et al* [13], in which 90.7% of respondents were aware of parasitological examination of blood to be the WHO recommended approach of establishing malaria diagnosis corroborates this finding from current research. Also a study done by Usman Rabi *et al* [14] reported more than half of respondents had good knowledge of mRDT in tandem with above finding. This calls for training of community pharmacist on the WHO T3 initiative as community pharmacist will be better equipped with knowledge to handle malaria case management.

The findings from this study which revealed that 28.5% of community pharmacists carry out malaria diagnosis with a confirmatory test before commencing treatment and 90% of the respondents indicated that they treat malaria based on clinical signs and symptoms only (presumptive/ syndromic treatment) is substantiated by results of a study conducted by Uzochukwu *et al* [15] in South Eastern Nigeria which reported that majority of health facilities practiced presumptive malaria case management. In contrast, a study conducted by Usman Rabi *et al* [14] on availability and use of mRDT in public health facilities reported 82.7% of the healthcare workers employed malaria RDT routinely before making a diagnosis of malaria. This may be largely due to public health facilities are less likely to commence treatment without diagnosis than private owned pharmacies which are profit-oriented. Malaria Rapid Diagnostic Test (mRDT) and a combination of mRDT and microscopy were the most common confirmatory test carried out. Most respondents (60.4%) reported that the confirmatory test most readily available was mRDT. Use of laboratory microscopy was

relatively low as seen also in previous studies [15, 16]. In spite of being regarded as the gold standard for malaria diagnosis; use of microscopy is low which is a positive development as it connotes wide acceptability of RDTs among the health workers. Despite the high rate of clinical diagnosis, a majority (84.1%) agreed that the confirmatory test is more effective and efficient in malaria case management than clinical diagnosis.

87% community pharmacists do not believe that clinical signs and symptoms only are sufficient in confirming malaria diagnosis, and for treatment initiation. Also, a majority (82.6%) of respondents agreed that a confirmatory test was sufficient in detecting the plasmodium parasite in suspected malaria, and agreed on the need to perform a confirmatory test on suspected malaria cases before treatment. This is in line with findings from previous study by Ndibuagu *et al* [13], where it was reported that 64% of healthcare providers thought it was important to perform a confirmatory diagnosis before commencing treatment, 70.9% opined that presumptive diagnosis of malaria is not a better way of making diagnosis and 76.7% did not believe malaria diagnosis is always clear on listening to the patient. In contrast Izuchukwu Frank Obi *et al* [17] noted poor perception of healthcare workers on mRDT that resulted in prescription of ACTs to negative cases though over 90% agreed that febrile patients should be tested before commencement of treatment. Most of the respondents stated that they have confidence in results from the malaria confirmatory test, this is supported study by Izuchukwu Frank Obi *et al* [17], showed that more than 80% of respondent said they fully trust a positive mRDT. However, those that indicated that they trust their skills in performing malaria test were less than 70%.

This study revealed that, there are no significant impact of socio-demographic characteristic on community pharmacists' practice of and opinion on malaria diagnosis. Furthermore, awareness and training in the WHO T3 initiative on malaria case management did not result in a significant difference in the opinion of community pharmacists regarding the importance of malaria diagnosis in malaria case management. Majority of the respondent who indicated to have been trained did so for just testing which may not be a sufficient exposure to inform change in a practice. A holistic training on WHO (testing, treating and tracking) malaria case management will help community pharmacist better appreciate the importance of practicing the WHO T3. Similarly, in a study by Izuchukwu Frank Obi *et al* [17] amongst health workers in Ebonyi state revealed that respondents socio-demographic characteristics did not impact significantly on health workers practice of malaria diagnosis. However, in this study it was discovered that significantly higher proportion of those who had received Training in testing practiced all three components (Testing, Treatment, and Tracking) of the WHO T3 initiative on malaria case management.

Also, a higher proportion of male community Pharmacists compared to females carry out malaria diagnosis with a

confirmatory test before treatment. In addition, a significantly higher proportion of those aware of the WHO recommended T3 initiative on malaria case management as well as those who had received training on malaria testing compared to those who are not aware and have not been trained reported carrying out malaria diagnosis with a confirmatory test before treatment.

Younger community pharmacists (<30years) and also significantly higher proportion of those with less than 10 years' work-related experience showed good perception of malaria confirmatory test. A similar study carried out in Thailand by Manas Kotepui et al [18] among health workers corroborates this finding in which good perception of malaria detection to be higher in health workers 20-29yrs of age and with less than 10 years' experience in support of the findings from this research. This could be due to improvement in awareness of and adoption of the WHO recommended malaria case management by countries especially in curriculums for health workers in training. Though there has been a rise in awareness of importance, yet more work needs to be done in ensuring that perception and knowledge translate into practice as a significantly higher proportion of respondents with less than 10 years' work experience think (possibly still practices) that clinical signs and symptoms only are sufficient in confirming malaria diagnosis and treatment.

There was no significant association of respondents' characteristics to their prescribing ACT for negative RDT test results. This contrast a study by Izuchukwu Frank Obi et al [17], which reported prescriber's professional cadre, perception of RDT, training on other causes of fever and health facility level to be significantly associated with ACT prescription to patients with negative RDT results. Prescription of ACTs to negative results may be due to lack of trust for a negative confirmatory result for malaria diagnosis as truly ruling out malaria, poor perception of confirmatory test to detect plasmodium parasite [17], to please patient or not to be seen as incompetent [19].

5. Conclusion

Findings from this study revealed that community pharmacists within Abuja Metropolis have good perception towards malaria diagnosis in that most community pharmacists do not believe in clinical diagnosis is sufficient for malaria diagnosis, and for treatment initiation rather that a parasitological confirmatory test should be performed in suspected malaria cases as recommended by WHO for malaria case management. Knowledge of malaria testing is good but there seem to exist knowledge gap in proper treatment and tracking of malaria cases. Furthermore, on malaria diagnosis, most respondents stated that they have confidence in results from the malaria confirmatory test. However, the gap lies in the practice, as not all trust their skills in performing malaria test and more than half of the respondents stated that they would treat for malaria regardless of negative confirmatory test results when the patient insists on treatment. This is so a call to action for

government, professional bodies in the health sector and all committed to fighting the scourge of malaria for more awareness to the general public on importance of the WHO T3 and capacity strengthening for the frontline health workers – community pharmacy attending to community needs on malaria case management.

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