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ORIGINAL ARTICLE

Sociodemographic Factors Influencing the Uptake of Rapid Diagnostic Test Kits for the Management of Malaria among Mothers of Under Five in a Typical Nigerian Population

U. W. Dozie*, C.I. C. Ebirim., U. O. Nwobi, U. M. Chukwuocha, S. N. O. Ibe, I. N. S. Dozie

ABSTRACT

Introduction: Globally, malaria constitutes a crucial public health challenge since it is the third major cause of death among children under the age of 5. Prompt and effectual malaria diagnosis is the major approach to the control and management of the disease. **Objectives**: The study investigated sociodemographic factors that influence the uptake of rapid diagnostic test (RDT) for malaria management among mothers of under 5. **Method of Study**: A descriptive cross-sectional design was used in the study in which 420 mothers of under 5 were randomly selected from five electoral wards in Owerri West L.G.A of Imo state. Structured questionnaire was used in data collection. Data were analyzed with SPSS statistical package (Version 21) in which Chi-square at 5% probability level was used to ascertain the association between sociodemographic and uptake of rapid diagnostic test (RDT). **Results**: Results showed that the mothers 161 (38%) were mostly in 30–49 years age bracket, were married (%). More than one-quarter of them was secondary school certificate holders who were civil servants who earn average monthly income of 10,000–17,000₦ 183 (44%). Less than half 180 (42.9%) of the mothers do test their child with RDT, particularly when their child has fever 103 (24.5%). Moreover, larger proportions 161 (89%) of this group know how to carry out RDT. Most of them indicated positive result of RDT to be double line on the strip 155 (86.1%). More than three-quarter of them 168 (93.3%) still use RDT even when they are aware that it involved finger prick of blood from the child. Majority of them 252 (60%) indicated that their custom/religion allows blood test when the child is ill. It was shown that the uptake of mRDT was more pronounced among mothers within the age group of 18–29 years (67.5%) ($\chi^2 = 50.12$; $P < 0.001$) who were single (75%) ($\chi^2 = 74.77$; $P < 0.001$). Uptake of mRDT was also highest (71.4%) among respondents who had tertiary education ($\chi^2 = 91.35$, $P < 0.001$) and are civil servants (57.1%) ($\chi^2 = 65.80$; $P < 0.001$) who earn average monthly income of 18,000 (68.8%) ($\chi^2 = 34.65$; $P < 0.001$). Within the communities, uptake of mRDT was highest among mothers from Obinze compared to other communities with significant association ($\chi^2 = 22.17$; $P < 0.001$). **Conclusion**: Uptake will, however, be enhanced if the cost of RDT-based management is reduced. Enhancing the health education through media, conferences, seminars, and workshops using local dialects will also help in raising the knowledge and understanding of less or non-educated mothers on the benefits of RDT.

Keywords: Malaria, Management, rapid diagnostic test, sociodemographic factors, uptake

INTRODUCTION

A quarter of all infant deaths in Nigeria and virtually a third (30%) of deaths in under-5 children were as a result of malaria.[1] Death of children from malaria disease is estimated to be more than 200 per day.[2,3] Not only does malaria cause illness and death in children but it also has long-term effects on them which manifests in the form of chronic anemia, low birth weight, reduced growth, and other cases severe mental retardation. Tabuti[4] also noted that

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malaria may cause absence from school and lethargy when in class leading to poorer academic performance which, in turn, could cause long-term social consequences.

Suffering caused by malaria and its contribution to poverty is likely to linger for long since the disease is resistant to many available, affordable, and safe antimalarial drugs.[5,6] Prompt and effectual treatment of every child with malaria is principal component of the disease control. Children who become ill with malaria need immediate and effectual treatment to avoid it from developing to severe stage and death.[7] It was estimated by Greenwood *et al*.[8] that 92% of deaths in children occur at home. Mothers and other caregivers are, therefore, of central importance in understanding severe or mild malaria diseases and pursuing treatment for their wards. In numerous endemic areas of Africa, malaria prevention and control that involved indoor residual spraying,[9] use of long-lasting insect treated nets,[10,11] and urgent diagnosis and proper management of uncomplicated malaria has substantially decreased morbidity and mortality.[12]

However, malaria remains a crucial public health challenge due to inadequate care[13] and the scarcity of effective diagnosis and treatment.[14] Many studies reported successfully symptomatic diagnosis in some remote areas,[15,16] in endemic areas, it has often proven problematic[17] resulting to overuse of antimalarial drugs. Often, patients who have fever at a health center are given artemisinin-based combination therapies (ACTs)[18] without initial parasitological diagnosis.[19,20] The World Health Organization (WHO)[21] proposed revised malaria treatment guidelines that demand test-based management of malaria disease in all endemic areas and across all age brackets. For practical reasons, rapid diagnostic test (RDT) was recommended to be the major tool for conducting test-based management of malaria. Malaria rapid diagnostic tests (mRDTs) serve as improved point-of-care diagnosis and provide better disease management in transmission settings.[22] In comparison with other diagnostic techniques including Giemsa stained thick and thin blood films examined under a microscope, mRDTs are cheap.[23,24] In addition to its easy use, RDTs provide reliable results within 15–20 min.[25,26] According to Baiden *et al*.,[27] arguments supporting the shift to RDTs include reduction in the spread of malaria in areas previously known to be very high that previously cheap antimalarials have been changed with relatively more expensive artemisinin-based combination therapy (ACT). Based on this, RDTs have become vital tools in malaria management and eradication.[28-30]

In spite of the susceptibility and heavy consequences of malaria among under-5 children, many researchers in Nigeria have concentrated on the incidence, prevalence knowledge, attitudes, and perception, and care-seeking behaviors in malaria management at the population level. However, on few studies on RDT, it was reported by Ranasinghe *et al*.[31] that although diagnosis before treatment is strongly recommended by clinical guidelines, there are varying factors that reduce access to and uptake of malaria testing. Regrettably, very little is known about these barriers. Comoe *et al*.[32] argued that community and cultural beliefs about blood and attitude of health workers may discourage testing. Furthermore, lower income earners may not be able to afford testing or may not make testing a priority when budgeting for health-care expenses,[32,33] in addition, rural dwellers may delay seeking care from formal health services because of the costs and time used in getting to the health-care facility.[34,35] Moreover, concerns about reliable access to mRDT for home-based diagnosis[36-38] and fear of infection transmission during blood sample collection[39,40] are the most commonly reported drawback to the utilization of home-based malaria diagnosis. In view of the above gap, this study evaluated the sociodemographic attributes that influence the uptake of RDT among mothers of children under-5 years in a typical Nigerian population.

MATERIALS AND METHODS

The study employed a descriptive cross-sectional design and a sample size of 420 mothers of under 5 was selected from a population of 21,000 which constitute the population of the mothers of under 5 in the Local Government Area (LGA).[41] Respondents were drawn from the five electoral wards in Owerri West L.G.A of Imo state using multistage cluster and systematic sampling techniques. This involved random selection of 84 participants from five villages representing the five wards.

Instrument for data collection was a validated structured questionnaire which addressed sociodemographic characteristics of the respondents and uptake of rapid diagnostic test. Verbal informed consent was obtained from each respondent. Two trained research assistants involved in the questionnaire administration and collection of data.

Statistical Package for the Social Sciences (SPSS) (version 21.0) was used for data analysis in which Chi-square test was used to test the association between sociodemographic attributes and RDT utilization by the participants.

RESULTS

Sociodemographic Characteristic of the Mothers

Presented in Table 1 are the results of the socio demographic characteristics of the participants where it was shown that majority 161 (38%) of the respondents were within the age bracket of 30-49 years. While minority 26 (6%) of them were above 60 years. A large proportion of them 216 (51%) was married followed by singles 116 (28%), divorced 51 (%), and widowed 37 (%). Most of the mothers 126 (30%) were secondary school certificate holders. In terms of occupation, the participants were dominated by civil servants 196 (47%) and most of them earn between 10,000 and ₦17,000 average

Table 1: Sociodemographic characteristic of the mothers

Variables	Frequency (n = 420)	Percentage
Age group		
18–29	114	27
30–49	161	38
50–59	119	28
Above 60	26	6
Marital status		
Single	116	28
Married	216	51
Divorced	51	12
Widowed	37	9
Educational level		
No formal education	55	13
Primary level	87	21
Secondary level	126	30
Tertiary level	84	20
Postgraduate level	68	16
Occupation		
Civil servant	196	47
Trader	135	32
Farmer	40	10
Currently unemployed	49	12
Average income (₦)		
18,000	93	22
10,000–17,000	183	44
18,000 above	144	34

monthly income compared to those that earn above ₦18,000 144 (34%) and ₦18,000 93 (22%).

Uptake of Rapid Diagnostic Test for the Treatment of Malaria among the Respondents

Table 2 shows the uptake of malaria rapid diagnostic test among mothers of under 5 in Owerri West LGA. It was shown that more than half of the mother 220 (52%) have heard about RDT compared to 200 (48%) who have not. It can also be observed that lesser proportion of them 180 (42.9%) test their child using RDT. However, less than half 161 (38%) of the respondents know how to carry out malaria rapid diagnostic test compared to majority 259 (62%) that do not know. Among the mothers under that use RDT, 155 (86.1%) were of the opinion that RDT-positive result is characterized by double line on the strip, whereas 25 (13.9%) were of the view that it is characterized by single line. Almost all the mothers 168 (93.3%) prefer to do the test even when they are aware that involved finger prick of blood from the child. Two hundred and fifty-two (60%) mothers indicated that their custom/religion allows blood test when their child is ill while it is hindered by the custom/religion of 168 (40%) participants. Figure 1 displayed the source of respondents' information on RDT where it was shown that most of the respondents 131 (60%) got their information of RDT from health workers.

Table 2: Uptake of rapid diagnostic test for the treatment of malaria among the respondents

Variables	Frequency	Percentage
Heard about rapid diagnostic test		
Yes	220	52
No	200	48
Total	420	100
Do you test your child with rapid diagnostic test		
Yes	180	42.9
No	240	57.1
Total	420	100
Do you know how to carry out malaria rapid diagnostic test		
Yes	161	38
No	259	62
Total	420	100
RDT-positive result is characterized by		
Single line on the strip	25	13.9
Double line on the strip	155	86.1
Total	180	100
Doing the test means that each time your child has fever some little (finger prick) blood will be taken to do the test, would you still prefer to do the test		
Yes	168	93.3
No	12	6.7
Total	180	100
Does your custom/religion allow blood test when your child is ill?		
Yes	252	60
No	168	40
Total	420	100

Figure 2 shows the frequency of malaria rapid diagnostic test utilization among mothers of under-5 children in Owerri West L.G.A. It was indicated that majority of the respondents 215 (51.2%) did not carry out mRDT test, 103 (24.5%) carry out mRDT anytime their child has fever, 71 (16.9%) once in 3 months, and 31 (7.4%) once in 6 months.

Table 3 shows the relationship between sociodemographic characteristic and uptake of malaria RDT for the treatment of malaria among mothers of under-5 children in Owerri West LGA. All sociodemographic characteristics had a statistically significant association with the uptake of malaria rapid diagnostic test. Among the 420 respondents, 180 (42.9%) tested their children with malaria rapid diagnostic test while 240 (57.1%) did not. In terms of age, uptake of RDT followed the trend of 18–29 years 77 (67.5%), 30–49 years 67 (41.6%), above 60 years 10 (38.5%), and 59 years 26 (21.8%), respectively, for those who tested their children with malaria RDT.

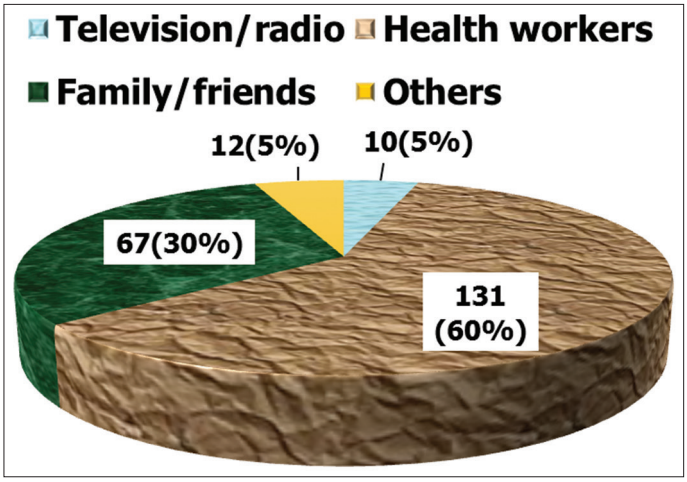

Figure 1: Source of information on RDT

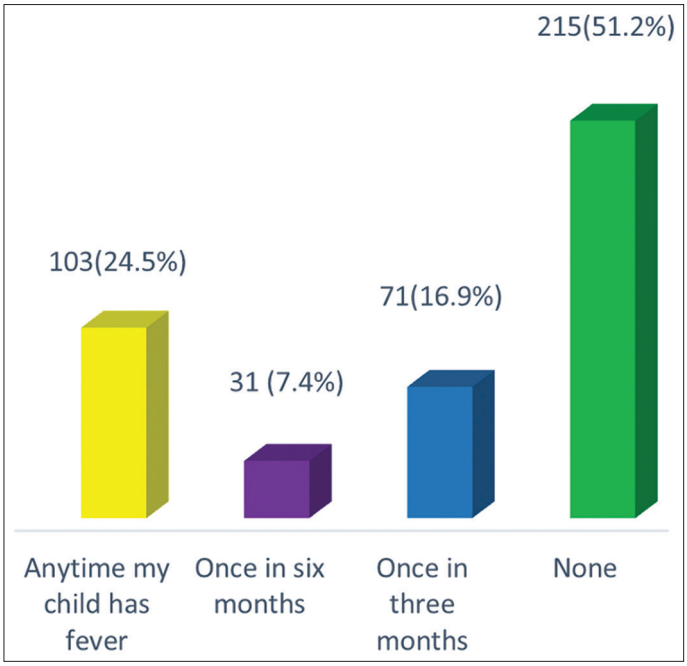

Figure 2: Frequency of usage of malaria rapid diagnostic test among mothers of under-5 children

It was also showed that 87 (75%), 74 (34.3%), 7 (13.7%), and 12 (32.4%) participants who were single, married, divorced, and widowed, respectively, tested their children with malaria RDT anytime they had fever. Out of the 420 respondents, 31 (56.4%), 22 (17.5%), 41 (32.5%), 60 (71.4%), and 45 (66.2%) who tested their child with malaria RDT had no formal education, primary, secondary, tertiary, and postgraduate education, respectively. As shown in table, 112 (57.1%), 28 (20.7%), 7 (17.5%), and 10 (20.4%) of the respondents who tested their child were civil servants, traders, famers, and currently unemployed. A greater proportion of the respondents earned ₦10,000–₦17,000, out of who majority of them 126 (67.8%) did not test their child with malaria RDT against 59 (32.2%) who tested their child, whereas respondents who earned ₦18,000 share the same fate of having more of those who did test their child 64 (68.8%), whereas lesser proportions of respondents who earned above ₦18,000 57 (39.6%) utilize RDT for their children. Considering the communities studied, it was shown that 30 (35.7%), 24 (28.6%), 34 (40.5%), 40 (47.6%), and 52 (61.9%) of the respondents in Eziobodo, Ihiagwa, Amakohia, Nekede, and Obinze, respectively, tested their child with RDT with strong statistical association ($\chi^2 = 22.167$, $P < 0.001$).

DISCUSSION

The study investigated sociodemographic factors that influence the uptake of rapid diagnostic test (RDT) for malaria management among mothers of under 5. Sociodemographic variables investigated were age, marital status, level of education, occupation, and average monthly income. It was clearly shown that the mothers were mostly (38%) in 30–49 years age bracket and were married (51%). This is similar to the study of Mushi *et al*.[42] on the acceptability of mRDT administered by village health workers in Northeastern Tanzania where majority of the under-5 mothers were within 25–34 years (42%) and most of them were also married (79%). However, under-5 mothers in the study of Chukwuocha *et al*.[43] in Ohaji/Egbema local government area of Imo state were within the age bracket of 22–28 years (32.8%). More than one-quarter of the respondents in the present study were secondary school certificate holders who were civil servants who earn average monthly income of 10,000–₦17,000. These were contrary to the findings of Chukwuocha *et al*.[43] where majority (45.5%) of the mothers had primary education as their highest level of education and earn low (0–₦50,000) monthly income (56.6%). Differences in the sociodemographic variables perhaps could be as a result of variation in the location and economic settings of the study area. Owerri West L.G.A has more than 3 higher institutions which may have influenced the socioeconomic status of the communities under studied.

The results also showed that more than half of the participants have heard about RDT and health workers were the major source of information on RDT. In the study of Ajumobi *et al*.,[44] only 5.3% know about any diagnostic testing for malaria. A study by Awoleye and Thorn[45] explained that availability of RDTs alone is not enough to determine adherence to compliance with the WHO guidelines that it should be combined with effectual communication. Therefore, low 10 (5%) rate of information on RDT from the media is not encouraging since every opportunity should be utilized in sensitizing the communities of any new development toward malaria management. However, less than half 180 (42.9%) do test their child with RDT. Contrarily, high level of acceptance was reported in Uganda and Tanzania,[46,47] although it was shown that the relatively high interest by respondents in RDT in an Ugandan study was due to mere curiosity than a genuine desire for the test result to inform clinical decision-making.[48] In addition, the Ugandan study was done within the private sector. The result was not in agreement with the findings of

Table 3: Relationship between sociodemographic characteristics and uptake of malaria rapid diagnostic test among caregivers of under-5 children in Owerri West L.G.A

Sociodemographic characteristic	Uptake of mRDT		Total	Chi-square	*P*-value
	Yes	No			
Age group				50.122	<0.001
18–29	77 (67.5)	37 (32.5)	114 (100)		
30–49	67 (41.6)	94 (58.4)	161 (100)		
50–59	26 (21.8)	93 (78.2)	119 (100)		
Above 60	10 (38.5)	16 (61.5)	26 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		
Marital status				74.773	<0.001
Single	87 (75)	29 (25)	116 (100)		
Married	74 (34.3)	142 (65.7)	216 (100)		
Divorced	7 (13.7)	44 (86.3)	51 (100)		
Widowed	12 (32.4)	25 (67.6)	37 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		
Educational level				91.348	<0.001
No formal education	31 (56.4)	24 (43.6)	55 (100)		
Primary level	22 (25.3)	65 (74.7)	87 (100)		
Secondary level	41 (32.5)	85 (67.5)	126 (100)		
Tertiary level	60 (71.4)	24 (28.6)	84 (100)		
Postgraduate level	45 (66.2)	23 (33.8)	68 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		
Occupation				65.799	<0.001
Civil servant	112 (57.1)	84 (42.9)	196 (100)		
Trader	28 (20.7)	107 (79.3)	135 (100)		
Farmer	7 (17.5)	33 (82.5)	40 (100)		
Currently unemployed	10 (20.4)	39 (70.6)	49 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		
Average income per month				34.645	<0.001
₦0.001n	64 (68.8)	29 (31.2)	93 (100)		
₦3 (1002h evel)	59 (32.2)	124 967.8)	183 (100)		
₦83 (1008 ncom)	57 (39.6)	87 (60.4)	144 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		
Community				22.167	<0.001
Eziobodo	30 (35.7)	54 (64.3)	84 (100)		
Ihiagwa	24 (28.6)	60 (71.4)	84 (100)		
Amakohia	34 (40.5)	50 (59.5)	84 (100)		
Nekede	40 (47.6)	44 (52.4)	84 (100)		
Obinze	52 (61.9)	32 (38.1)	84 (100)		
Total	180 (42.9)	240 (57.1)	420 (100)		

Comoé *et al*.[32] who reported that most of participants found mRDTs of no use. This perhaps could be associated with poor awareness of mRDTs. Refusals among parents/caregivers of under-5 children as regards earlier testing in health facility-based studies conducted in Tanzania and other countries were reported to be due to believes that malaria symptoms are easily recognized and they are aware antimalarials that are readily accessible for self-treatment.[42]

Moreover, larger proportions 161 (89%) of this group know how to carry out RDT. Most of them indicated positive result of RDT to be double line on the strip 155 (86.1%). In the study conducted by Nwankwo *et al*.[49] on pharmaceutical outlets, most of the respondents 159 (97.5%) specified that a positive result is indentified by double line on the strip. It is likely that most of the respondents received adequate information on the accurate interpretation of RDT result from the health workers whom they

got their information on RDT from. More than three-quarter of them still use RDT even when they are aware that it involved finger prick of blood from the child. Refusals for testing were linked to previous experiences with blood taking and use. For example, blood sample could also be used for other occult practices such as fetishisms and bewitching. Many people see blood as a sacred biofluid and source of life; therefore, it cannot be used anyhow except when the need arises or during known medical testing.[32] In addition, out of the 420 respondents, majority of them 252 (60%) indicated that their custom/religion allows blood test when the child is ill. Health-care utilization is best understood within the cultural settings of people involved.[50] Cultural beliefs which have to do with peoples' norms often detect health-seeking behavior of the people.

All the sociodemographic variables investigated had significant ($P < 0.001$) association with the uptake of RDT. It was clearly shown that the uptake of mRDT was more pronounced in mothers within the age group of 18–29 years (67.5%) who were single (75%), suggesting that uptake of RDT is higher in younger mothers. This perhaps could be as result of the advantage of more urge for information among these youths. It is not certain why young mothers have advantage in this regard, Bazzano *et al*.[51] and Thairu *et al*.[52] suggested that it might be that they are less likely to be socially independent. Furthermore, uptake of mRDT was highest (71.4%) in respondents who had tertiary education and are civil servants (57.1%). In a study by Mushi *et al*.,[42] there result similarly showed that willingness to utilize mRDTs was significantly higher among caregivers that attended formal education compared to those with no formal education. This suggests that tertiary education exposes one to a wider range of information on awareness of health issues. It was observed by Tusting *et al*.[53] that the chances of dying from malaria decline with increasing educational status. Ricci[54] asserted that education plays a crucial role in service demand and health personnel are likely to give adequate attention during testing if they recognize that the patient can comprehend.

Most of them earn average income of ₦18,000 (68.8%). Lower income earners may not be able to afford testing or may not make testing a priority when budgeting for health-care expenses,[32,33] in addition, rural dwellers may delay seeking care from formal health services because of the costs and time used in getting to the health-care facility.[34,35] Within the communities, uptake of mRDT was highest among mothers from Obinze compared to other communities with significant association ($\chi^2 = 22.167$, $P < 0.001$). It was also reported by Nyarko and Cobblah[55] that there is a relationship between region of residence and malaria treatment in under-5 children. Variation in availability of hospitals/health-care centers could be the reason.

CONCLUSION

The findings indicated that less than half of the mothers do test their under-5 child with rapid diagnostic test (mRDT). All the sociodemographic variables investigated had significant ($P < 0.001$) association with the uptake of RDT for malaria treatment among mothers of under-5 children. It was clearly shown that the utilization of mRDT was higher in mothers within the age bracket of 18–29 years who were single. Furthermore, uptake of mRDT was more pronounced in participants who had tertiary education and are civil servants earning average monthly income of ₦18,000. To increase uptake, there is a need to reduce the cost of RDT-based management and also enhance the health education through media, conferences, seminars, and workshops as this will also help in raising the knowledge and understanding of less or non-educated mothers on the benefits of RDT.

AUTHORS' CONTRIBUTIONS

UWD: Conceived the study, supervised the study, and drafted the manuscript. CICB: Study design, data analysis, and revisited the manuscript, UON: Study design and data collection, UMC, SNOI and INSD: Revisited the manuscript and critically evaluated the intellectual contents. All authors read and approved the final version of paper.

TAKE HOME MESSAGE

In spite of the susceptibility and heavy consequences of malaria among under-5 children, many researchers in Nigeria have concentrated on the incidence, prevalence knowledge, attitudes, and perception, and care-seeking behaviors in malaria management at the population level. There is urgent need to evaluate the sociodemographic attributes that influence the uptake of RDT among mothers of children under-5 years in a typical Nigerian population.

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