

# Rural-urban disparities and factors associated with delayed care seeking for fever by mothers of under-five children, Igabi LGA, Kaduna Nigeria.

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## Research Article

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# Abstract

**Background** Fever in under-five children (U5) is the commonest presenting complaint in general practice and mothers' recognition is an entry point for fever treatment including malaria. This study describes rural - urban disparity in fever prevalence, mothers' malaria knowledge, and care seeking for fever in U5 and the associated factors. **Methods** A cross-sectional survey was conducted among 630 mother-child pairs [rural (300) and urban (330)] selected randomly using a multi-stage sampling from 63 villages in Igabi LGA, Kaduna State, Nigeria. Trained female data collectors administered a pre-tested structured questionnaire to collect information on mother-child demographic profiles, malaria knowledge, fever episodes in birth order last child in two weeks prior to survey, and care - seeking for fever within 48 hours of onset. Care sought for fever > 48 hours of onset was defined as delayed care seeking. Malaria knowledge was categorized into good, average and poor if the final scores is  $\geq 75$  th , 50 th - 74 th , and < 50 th percentiles, respectively. Frequency, proportions, and odds ratio were calculated. Statistically significant was set at p-value < 0.05. **Results** The median age (interquartile range) of rural mothers was 30 (IQR, 10) years compared to 27 (IQR, 6) years in urban. Of the 70.0% (441/629) U5 children with fever, 58.5% (258/441) were in rural settlements. A third of the mothers whose child had fever sought care. Mothers in rural settlement were 2.7 (CI: 1.8 – 4.2,  $p < 0.01$ ) times more likely to delay care seeking for fever, and those with no knowledge of malaria transmission were 70% less likely to seek care (OR: 0.3, CI: 0.2 – 0.7). On the other hand, poor perception of malaria as a major health problem (OR: 2.1, CI: 1.4 – 3.1), and poor knowledge of cause of malaria (OR: 1.7, CI: 1.1 – 2.5) were associated with delayed seeking for fever among urban mothers. **Conclusions** Disparity existed between fever prevalence in U5 children, care -seeking practices by their mothers, and factors associated with delayed care seeking for fever. Fever treatment for high impact malaria elimination needs a context specific intervention rather than 'one-size-fits-all' approach. Also, intensify efforts to educate mothers on malaria.

## Background

Globally, 228 million malaria cases and 405,000 deaths were reported in 2018; India and 18 African countries accounted for 85% of these cases [1]. Children were more vulnerable with 67% of deaths in those less than the age of five years [1]. In 2018, Nigeria was the first among the 11 countries with high malaria burden globally, accounting for 25% of cases and 24% of deaths globally; although 40% of the population at risk slept under long-lasting insecticidal nets [1]. There was a one-fifth reduction (20%) in the proportion of under-five children (U5) that were positive for malaria using the malaria rapid diagnostic test from (45%) in 2015 [2] to (36%) in 2018 [3].

Recently, data have shown a global reversal in the gains of malaria control [4]. Malaria account for significant burden of febrile illnesses in endemic areas [5] and to achieve the vision of malaria elimination, a country-led 'High burden to High impact' approach was recommended by WHO in 2018. The approach aimed at redirecting the static global malaria control response with focus on high malaria burden countries for impact. The pillar two of this approach emphasized the use of strategic information rather than one-size-fits-all approach to drive this impact. This encourage sub-national evidence -based

stratification strategic information and interventions to drive impact for improve malaria elimination [4]. This underscores localized effort with focus on high-burden settings where intensified malaria interventions efforts are targeted at drastic reduction in malaria cases and deaths.

In Nigeria, like in other tropical countries, fever serves as a useful marker for recognition of infectious in under-five children including malaria [6, 7]. The prevalence of fever in U5 children in Kaduna State, Nigeria in 2018 was 26% [3]. Fever is a primary complaint for a third of all paediatric consultations in general practice [6, 8], and an entry point for parents or mothers to seek medical attention for U5 children including malaria diagnosis and case management [7, 9, 10]. Though fever is not a pathognomonic sign of malaria, it usually trigger mothers to take further actions in seeking appropriate care which may be diagnosed as malaria eventually [1].

Mothers' health seeking behaviour for febrile illness in U5 children is not commensurate with the high malaria burden in Nigeria, a country with favourable climatic conditions for malaria transmission [1, 2, 4, 11, 12]. Usually, mothers being the most-at-home in Nigeria take the first step in seeking treatment for their febrile child [13]. The knowledge and perception of the causes of the fever, and fever as indicator of illness severity may contribute to mothers' decision on how, when, and where to seek treatment advice. The Nigeria Demographic Health Survey 2018 revealed that 29% of mothers with no education had the highest proportion of children with a fever in the past 2 weeks [3] and six out of ten mothers sought advice from private sectors like patent medicine vendors and pharmacists. Additionally, home self-medication is a common response of mothers to fever like in other high malaria endemic countries [6, 13, 11]. Therefore, several factors may influence mothers to seek care or advice for fever within 48 hours of onset in U5 children.

Some of the factors influencing mothers' seeking advice or treatment for fever are short duration of fever [1], the season (rainy season) of the fever which coincides with high prevalence of malaria, source of treatment [14], rapid recovery from fever, rural location, availability of community-based health workers at health facilities, availability of malaria commodities in the health facilities, mother's level of education, mothers knowledge and perception of fever and malaria [10, 15], lack of money for transportation and other expenses to treat the fever, and the age and sex of the child [16], perception of the family decision maker, mothers' employment status [17], household size of less than four members [12], and hospital waiting time [13, 18–21]. These factors differ from one locality to another and within sub-populations. They influence mothers' care seeking behaviour for fever treatment in U5 children.

Despite the several measures put in place to reduce the prevalence of fever, a quarter of U5 children in Kaduna Nigeria had fever in last 2 weeks in 2018 National Demographic Health Survey. Therefore, to develop a context specific approach to fever treatment and drive high impact malaria elimination process in Igabi LGA Kaduna Nigeria, this study will provide information for intervention development. Therefore, it aimed to describes rural - urban disparity in fever prevalence, mothers' malaria knowledge, and associated factors with delayed care seeking for fever in U5.

# Methods

## Study area

Igabi Local Government Area (LGA) with headquarters at Turunku, is one of the 23 LGAs in Kaduna State, North-west geopolitical zone, Nigeria. It has a population of 557,624 and is sub-divided into five urban districts, which are, Afaka, Birnin-yero, Kwarau, Rigachikun and Rigasa, and seven rural districts namely, Fanshanu, Gwaraji, Igabi, Kerawa, Sabo-Birnin, Turunku, and Zangon Aya. The LGA is located 650m above sea level, between latitude  $10^{\circ} 47' 0''$  N and longitude  $7^{\circ} 46' 0''$  E in the tropical Sahel to Sudan Savannah with annual rainfall varying from 1000 – 1500 mm and highest precipitation of 72% in August. The rainy season and period of high malaria transmission is usually from June to October. The annual mean temperature is  $34^{\circ}\text{C}$ . This can rise to  $41^{\circ}\text{C}$  at the peak of the dry season in April and drop to as low as  $12^{\circ}\text{C}$  in January during severe harmattan. The prevalence of malaria cases diagnosed microscopically among under-five children in Kaduna state is 36.7% [2] This study employed a cross-sectional design.

## Study design and population

This was a part of a larger study that has been published and addressed the characteristics of women of child bearing age (WCBA) associated with Long-lasting insecticidal nets (LLIN) ownership and utilization [22]. Moreover, the current analysis focused on rural - urban disparity in fever prevalence, mothers' malaria knowledge, and associated factors with delayed care seeking for fever in U5 children. Mothers and their under-five children with at least 12 months of residence in the selected households in the community were included. Anyone with cognitive deficits, or any chronic and debilitating illness that hinders effective participation in an interview was excluded.

## Sample size determination

Using the formula,  $n = z^2pq/d^2$  at 95% confidence interval (1.96), the percentage for children with fever for whom advice or treatment was sought in North-Western Nigeria is 63.6% [23] with a confidence limit of +/- 5%, and a non-response rate of 10%. To adjust the required sample size for cluster sampling design, a correction factor of 1.5 design effect was used as a less heterogenous communities in this district was assumed. Therefore, the calculated minimum sample size was 615. However, a minimum sample size of 630 was used to accommodate the sample size for the WCBA study [22].

## Sampling technique

Participants were selected using multi-stage sampling technique (Figure 1).

The sampling technique has been described elsewhere [22]. In Stage 1, Igabi LGA was stratified into rural and urban wards and ten wards were randomly selected. These included six rural wards - Fanshanu, Gwaraji, Igabi, Sabo-Birnin, Turunku, Zangon Aya and four urban wards - Afaka, Birnin-yero, Rigachikun, and Rigasa. For the selection of a cluster or village/settlement in stage 2, we used the household enumeration data generated by WHO/UNICEF during micro-planning for the mass long-lasting

insecticidal nets (LLIN) campaign in these settlements as the sampling frame. With a sample size of 630, to improve the validity and precision of estimates and considering a wide community representation (population variance), using a probability proportional to size; 63 villages or clusters (i.e., 30 rural and 33 urban) were randomly selected with a cluster size of 10. Using the list of the households in each village/settlement generated during micro planning for mass LLIN distribution, ten households were systematically selected from each village/settlement at stage 3. One mother each was interviewed in a household. In a selected household with multiple eligible mothers of under-five children, one was randomly selected by the ballot and recruited into the study. The last childbirth order of the eligible mothers was recruited into the study and if the last child was a set of twins, one of the twins was randomly selected by balloting.

## **Data collection**

Data was collected by ten trained female community health extension workers and nurses who speak English and Hausa languages fluently and reside within the district from September to October 2015 as described elsewhere [22]. They were supervised by five undergraduate medical students. The data collection tool was a pretested, structured questionnaire adapted from the Malaria Indicator Survey [24,25] and other literature [26,27]. This was used to collect information on demographic profile, mother's knowledge of malaria, history of fever onset in under-five children and mothers' fever treatment seeking behaviour within 48 hours of fever onset. The malaria knowledge items were questions from the literature, malaria indicator surveys and demographic health surveys. The questionnaire's face and content validity, item's accuracy, relevance, and clarity has been described elsewhere [22]. The knowledge of malaria was assessed using six thematic areas including cause of malaria, mode of malaria transmission, mosquito feeding time, malaria symptoms, malaria diagnosis and malaria prevention. Participants who correctly responded that mosquito bites caused malaria, malaria transmissions to humans is through the bite of mosquito, malaria mosquito feeding time was night-time, malaria symptoms are fever and any other symptoms, and malaria preventions by using either the Long Lasting Insecticidal Nets, Indoor Residual Spray or mosquito repellent coils were given "1" and incorrect responses scored "0". The individual score was calculated by finding a percentage of total score obtained from maximum allowable score of 6 and knowledge of malaria was categorized using percentile scores. Good knowledge of malaria, if final score falls at 75<sup>th</sup> percentile or more, score between 50<sup>th</sup> to 74<sup>th</sup> percentile as average knowledge and poor knowledge if score was < 50<sup>th</sup> percentile.

## **Study variables**

The outcome or dependent variables for this study was mothers' care/treatment seeking advice for fever within 48 hours of onset. Independent and explanatory variables were under-five children and respondents' characteristics and mother's knowledge of malaria items. Fever was assumed by mothers after tactile palpation of the children's skin and felt the hotness beyond normal. However, any fever episode in under-five children two weeks prior to the survey was taken as history of fever from which questions were asked from the mothers to know if advice or treatment was sought. Delayed care seeking

for fever was defined as inability of the mothers to seek care for U5 children withing 48 hours of fever onset [28].

## Data processing and analysis

Data were entered and analysed using Epi-Info version 7 statistical software. We calculated frequency and proportions for socio-demographic characteristics, knowledge of malaria, presence of fever in under-five children in last two weeks, and mothers seeking advice or treatment for fever within 48 hours of onset. We calculated median (range) for continuous descriptive variables, frequency and proportions for categorical variables. Chi squared test was used to test for association between dependent outcome and independent categorical variables; results were presented in odd ratios at 95% confidence interval (C.I). To understand the associations between explanatory variables and delayed care seeking for fever, a rural-urban stratification analysis was done. Any associated factors with p value  $\leq 0.2$  were selected for upward loading into multivariable logistic regression model to identify predictors of delayed care seeking for fever by the mothers. Results of all statistical analyses were considered significant at p-value of  $<0.05$ .

## Results

### Mothers and under five children's characteristics

Six hundred and twenty-nine (99.8%) mothers or caregivers completed the interview of which 258 (41.1%) were employed, and 300 (47.7%) were living in rural communities. The median (interquartile range, IQR) age of mothers in the rural communities was higher 30 (IQR, 10) than the urban 27 (IQR, 6). Table 1 shows that 61.7% (185/360) of rural mothers had no education, but 45.3% (149/329) urban mothers had secondary level of education. There were significant differences in the rural and urban mothers' age ( $p = 0.001$ ), educational level ( $p = 0.001$ ) and occupations ( $p = 0.001$ ). The median age (IQR) of the children was 12 months (IQR, 12). Of the 629 children 56.4% (355/629) were males, 50.6% (318/629) were aged 1 – 12 months and 29.1% (183/629) aged 13 – 24 months.

**Table 1:** Sociodemographic characteristics of respondents by location of residence (Rural/Urban), Igabi LGA, Kaduna Nigeria (N = 629)

Characteristics	Rural	Urban	Total
<b>Mother's age group (Years)</b>			
15 - 19	11 (3.7)	11 (3.3)	22 (3.5)
20 - 24	34 (11.3)	56 (17.0)	90 (3.5)
25 - 29	63 (21.0)	141 (42.9)	204 (32.4)
30 - 34	112 (37.3)	72 (21.8)	184 (29.3)
35 - 39	54 (18.0)	28 (8.5)	82 (13.0)
40 - 44	21 (7.0)	17 (5.2)	38 (6.0)
> 44	5 (5.5)	4 (4.4)	9 (1.4)
<b>Tribe</b>			
Fulani	6 (02.0)	33 (10.0)	39 (6.2)
Hausa	276 (92.0)	254 (77.2)	530 (84.3)
Igbo	0 (0.0)	9 (2.7)	9 (1.4)
Yoruba	0 (0.0)	15 (4.6)	15 (2.4)
Others*	18 (6.0)	18 (5.4)	36 (5.7)
<b>Educational level</b>			
None	185 (61.7)	70 (21.3)	255 (40.5)
Primary	90 (30.0)	54 (16.4)	144 (22.9)
Secondary	25 (8.3)	149 (45.3)	174 (27.6)
Tertiary	0 (0.0)	56 (17.0)	56 (8.9)
<b>Occupation</b>			
Housewife	208 (69.3)	153 (42.4)	361 (57.5)
Trader	39 (13.0)	72 (21.9)	111 (17.6)
Civil servant	5 (1.7)	55 (16.7)	60 (9.5)
Craft/Artisan	20 (6.7)	34 (10.3)	54 (8.6)
Farmer	28 (9.3)	6 (1.8)	34 (5.4)
Student	0 (0.0)	9 (2.7)	9 (1.4)

\*Nupe (8), Jaba (3), Ebira (3), Gwari (1), Kanuri (1), Mada (1) Shuwa arba(1)

Urban under-five children were younger, median age (IQR) was 12 (IQR 12) months compared to 24 (IQR 12) months in rural children.

## Knowledge of malaria

Overall, 553 (87.9%) respondents knew that malaria is transmitted to humans through the bites of infected mosquito, 432 (68.7%) knew that malaria causing mosquitoes commonly feed on humans at night-time, 527 (83.8%) knew malaria symptoms, and 381 (60.6%) knew that malaria Rapid Diagnostic Testing kit and microscopy are useful in detecting if malaria causing organisms (parasites) is the cause of a fever. Of all the respondents, 342 (54.4%) mentioned that malaria can be prevented with the use of LLINs, indoor residual spray and mosquito repellent coils.

Table 2: Knowledge of malaria among respondents by location of residence (Rural/Urban), Igabi LGA, Kaduna Nigeria, (N = 629)

Knowledge Items	Rural	Urban	Total
<b>Cause of malaria</b>			
Mosquito bite	145 (48.3)	212 (64.4)	357 (56.8)
Fever	17 (5.7)	0 (0.0)	17 (2.7)
Stagnant water, dirty environment,	21 (7.0)	32 (9.7)	53 (8.4)
No response	117 (39.0)	85 (25.8)	202 (32.1)
<b>Malaria transmission route to humans</b>			
Bite of malaria infected mosquito	261 (87.0)	292 (88.7)	553 (87.9)
Through contaminated water and foods	9 (3.0)	22 (6.7)	31 (4.9)
Don't know	30 (10.0)	15 (4.6)	45 (7.2)
<b>Malaria mosquito feeding time</b>			
Night-time	156 (52.0)	276 (83.9)	432 (68.7)
Both day and night-time	73 (24.3)	44 (13.4)	117 (18.6)
Day time	11 (3.7)	4 (1.2)	15 (2.4)
Don't know	60 (20.0)	5 (1.5)	65 (10.3)
<b>Malaria Symptoms</b>			
Headache	217 (72.3)	262 (79.6)	479 (76.1)
Fever	269 (89.7)	309 (93.9)	578 (91.9)
Shivering	162 (54.0)	119 (36.2)	281 (44.7)
Vomiting	164 (54.7)	188 (57.1)	352 (56.0)
Nausea	40 (13.3)	86 (26.1)	126 (20.0)
Dizziness	44 (14.7)	115 (34.9)	159 (25.3)
Loss of appetite	28 (9.3)	96 (29.2)	124 (19.7)
Diarrhoea	50 (16.7)	38 (11.5)	88 (14.0)
<b>Malaria diagnosis</b>			
Testing blood with RDT	158 (52.7)	128 (38.9)	286 (45.5)
Symptomatically	58 (19.3)	134 (40.7)	192 (30.5)
Blood microscopy	47 (15.7)	48 (14.6)	95 (15.1)
Don't know	37 (12.3)	19 (5.8)	56 (8.9)
<b>Malaria Prevention</b>			
LLINs	108 (36.0)	144 (43.8)	252 (40.1)
Indoor Residual Spray	1 (0.3)	66 (20.1)	67 (10.5)
Use mosquito coil or repellent	51 (17.0)	90 (27.4)	141 (22.4)
Clearing of grasses/avoid breeding sites	197 (65.7)	228 (69.3)	425 (67.6)
Wearing long sleeve shirts	9 (3.0)	10 (3.0)	481 (76.1)
<b>Knowledge of malaria</b>			
Good	114 (38.0)	121 (34.6)	268 (42.6)
Average	77 (25.7)	94 (26.9)	165 (26.2)
Poor	109 (36.3)	135 (38.5)	196 (31.2)

## Fever occurrence in under-five children and mothers' care seeking practice

Overall, 441 (70.0%) of the respondents reported any fever episode in last two weeks before survey among their under-five children but only 155 (35.2%) sought advice for care/treatment of fever within 48 hours of onset. Fever in last two weeks was commonly reported by mothers of under-five children in rural settlements 258/300 (86.0%) than the urban counterpart 183/329 (55.6%). But less rural mothers 63/258

(24.4%) than the urban counterpart 92/183 (50.3%) sought care or advice for fever within 48 hours of onset.

Of the 155 mothers who sought advice for care/treatment for fever within 48 hours of onset, 52 (33.5%) did home self-medication, 28 (18.1%) sought care at general hospital, 27 (17.4%) went to the pharmacy or patent medicine vendors' shop, 17 (11.0%) visited private hospitals and 5 (3.2%) sought advice from traditional/herbal treatment home. More rural mothers, 195/258 (75.6%) compared to 91/183 (49.7%) from urban settlements did not seek advice or care for fever within 48 hours. Of the 155 mothers who sought advice for care or treatment for fever within 48 hours of onset, 115 (74.2%) were given drugs to treat fever or what was perceived to cause the fever, but only 17 (11.0%) had their children's blood tested for malaria, and 11 (7.1%) had their children hospitalised following the fever episode (Table 3).

**Table 3: Fever in under-five children and mothers' care seeking practice for fever, Igabi LGA, Kaduna Nigeria.**

Characteristics	Rural	Urban	Total	OR (95% C.I)	p Value
<b>Child had fever (n = 629)</b>					
Yes	258 (86.0)	183 (55.6)	441 (70.0)	4.9 (3.3 - 7.3)	< 0.01
No	42 (14.0)	146 (44.4)	188 (30.0)		
Total	300 (47.7)	329 (52.3)	629		
<b>Mother sought care within 48 hrs (n = 441)</b>					
No	195 (75.6)	91 (49.7)	286 (64.8)	3.1 (2.1 - 4.7)	< 0.01
Yes	63 (24.4)	92 (50.3)	155 (35.2)		
Total	258 (58.5)	183 (41.5)	441		
<b>Child given drugs for fever (n = 155)</b>					
Yes	41 (65.1)	74 (80.4)	115 (74.2)	0.4 (0.2 - 0.9)	< 0.04
No	22 (34.9)	18 (19.6)	40 (25.8)		
Total	63 (52.6)	92 (47.4)	155		
<b>Any nets in household for sleeping (n = 629)</b>					
Yes	269 (89.7)	228 (69.3)	497 (79.0)	3.8 (2.5 - 6.0)	< 0.01
No	31 (10.3)	101 (39.7)	132 (21.0)		
Total	300 (47.7)	329 (52.3)	629		

### Factors associated with delayed care seeking for fever in U5 children

Women who lived in rural communities were three times more likely to delay seeking care compared to their urban counterpart (OR: 3.1, 95% CI: 2.1 – 4.7,  $p < 0.001$ ) as shown in Table 4. Mothers with no formal education were twice more likely to delay care seeking for fever (OR: 1.8, CI: 1.2 – 2.7,  $p = 0.003$ ) compared to those with formal education. Those who sees malaria as not a major health problem were thrice more likely (OR: 2.6, CI: 1.2 – 5.6,  $p = 0.01$ ) to delay care seeking for fever in U5 and those having poor knowledge of cause of malaria were twice more likely to delay care seeking compared to mothers

with good knowledge (OR: 1.7, CI: 1.1 – 2.5,  $p = 0.01$ ). Those who had poor knowledge of malaria mosquitoes feeding time were twice more likely to delay care seeking for fever in U5 children (OR: 1.7, CI: 1.1 – 2.6,  $p = 0.01$ ).

**Table 4: Factors associated with delayed care seeking for fever by mothers of U5 children, Igabi LGA, Kaduna Nigeria. (N = 441)**

Characteristics	Delayed care seeking		Total	95% CI	p Value
	Yes	No			
<b>Mother's age &lt; 30 years</b>					
Yes	122 (59.8)	82 (40.2)	204	0.7 (0.4 - 0.9)	0.04
No	164 (69.2)	73 (30.8)	237		
<b>Type of community</b>					
Rural	195 (75.6)	63 (24.4)	258	3.1 (2.1 - 4.7)	< 0.01
Urban	91 (49.7)	92 (50.3)	183		
<b>Mother's had formal education</b>					
No	150 (72.1)	58 (27.9)	208	1.8 (1.2 - 2.7)	< 0.01
Yes	136 (58.4)	97 (41.6)	233		
<b>Religion</b>					
Christianity	11 (78.6)	3 (21.4)	14	2.0 (0.6 - 7.4)	0.27
Islam	275 (64.4)	152 (35.6)	427		
<b>Malaria, a major health problem</b>					
No	40 (81.6)	9 (18.4)	49	2.6 (1.2 - 5.6)	0.01
Yes	246 (62.8)	146 (37.2)	392		
<b>Mothers knows what causes malaria</b>					
No	137 (71.4)	55 (28.6)	192	1.7 (1.1 - 2.5)	0.01
Yes	149 (59.8)	100 (40.2)	249		
<b>Mothers knows mode of malaria transmission</b>					
No	27 (57.4)	20 (42.6)	47	0.7 (0.4 - 1.3)	0.26
Yes	259 (65.7)	135 (34.3)	394		
<b>Mothers knows mosquitoes feeding time</b>					
No	111 (72.5)	42 (27.5)	153	1.7 (1.1 - 2.6)	0.01
Yes	175 (60.8)	113 (39.2)	288		
<b>Mothers knows malaria symptoms</b>					
No	232 (65.9)	120 (34.1)	352	1.3 (0.7 - 2.0)	0.35
Yes	54 (60.7)	35 (39.3)	89		
<b>Mothers knows how to detect if fever is caused by malaria</b>					
No	189 (66.5)	95 (33.5)	284	1.2 (0.8 - 1.8)	0.32
Yes	97 (61.8)	60 (38.2)	157		
<b>Mothers knows malaria prevention measures</b>					
No	142 (61.2)	90 (38.8)	232	0.7 (0.4 - 1.0)	0.09
Yes	144 (68.9)	65 (31.1)	209		
<b>Total</b>	<b>286 (64.9)</b>	<b>155 (35.1)</b>	<b>441</b>		

Overall, the observed significant associations between mothers' characteristics and delayed care seeking for fever was modified by rural – urban community stratification. On stratification, among the urban mothers, the perception that malaria is not a major health problem (OR: 2.1, CI: 1.4 – 3.1) and not

knowing the cause of malaria (OR: 1.7, CI: 1.1 – 2.5) were the significant factors associated with delayed care seeking for fever in U5. But in rural dwelling mothers, those who did not know the mode of malaria transmissions were 70% less likely to delay care seeking for fever (OR: 0.3, CI: 0.2 – 0.7).

The predictors of mothers delaying seeking care for fever were rural location and mothers' perception that malaria is not transmitted to human through mosquito bites. Mothers in rural settlements were about thrice more likely to delay care seeking for fever in U5 children (adjusted OR: 2.7, CI: 1.8 – 4.2,  $p < 0.01$ ). Finally, mothers who lacked the knowledge of malaria transmissions to humans were 60% less likely to delay seeking care for fever in U5 children (adjusted OR: 0.4, CI: 0.2 – 0.8,  $p = 0.02$ ).

## Discussion

This study describes rural - urban disparity in fever prevalence, mothers' malaria knowledge, and factors associated with delayed care seeking for fever in U5 children at Igabi LGA, Kaduna state, Nigeria. The rural – urban disparity exists in the age of U5 children and their mothers. Also, the urban mothers were more educated, currently employed and knowledgeable on malaria than their rural counterparts. However, the rural dwelling mothers reported high prevalence of fever in U5 children, but those who sought care for fever were few.

Living in rural settlement is associated with low level of education and may influence poor knowledge of malaria [1]. In line with previous literature, the urban mothers were exposed to formal education earlier, have access to newspapers, television, internet and social media for health information [3]. This may account for good knowledge of malaria among urban mothers than their rural counterparts. The mothers' knowledge of malaria and the recognition of fever in U5 children is vital to activate care seeking for treatment [15]. The knowledge among urban mothers does not translate to high proportion of households with mosquito nets and utilization by U5 children [22] compared with high proportion of rural mothers with poor knowledge [3].

In Nigeria, fever episode is usually common in rural communities and was corroborated in this study [2]. The educational level of mothers may influence their decision to seek advice for care or treatment of fever in U5 children within 48 hours of onset. In this study, fever episode among U5 children in last 2 weeks occurred in three out of four. This was higher than a quarter reported in the 2018 DHS and 52.1% reported in 2015 Malaria Indicator Survey (MIS) for North West Geopolitical Zone, Nigeria [2], a survey that was done at same time as this study. Also, more fever episodes were reported in rural U5 children, like what was reported for Kaduna state in 2018 DHS where mothers in rural communities reported high proportion of U5 children with fever. Also, mothers living in urban communities sought advice for fever in U5 children earlier than rural mothers [3]. The proportion of mothers who sought advice promptly for care or treatment of fever episode within 48 hours of onset in U5 children was similar to 31.4% reported in 2015 MIS but lower to a study in Northern Nigeria that reported 61.5% [19], and 73% reported for Kaduna State in DHS 2018 [3] but higher than 28.6% reported in Ethiopia [10].

Approximately, four out of ten mothers sought care from a skilled health workers in hospital or primary health centre similar to other studies from Northern Nigeria [17, 19] but higher than 28% in 2018 DHS [3]. The study like others, reported similar proportions of mothers who sought care at pharmacy shops or patent medicine vendors [15, 12, 16, 18, 29] but some mothers resorted to self-medication at home and this proportion was lower to a study from south eastern Nigeria [18] and Myanmar [16]. Good knowledge of malaria transmission and prevention has been found to be associate with care seeking from skilled health workers for fever treatment [21], self-medication at home for fever in U5 children has also been associated with mothers' level of education [1] and was the case in our study, as three out of five mothers with formal education practiced self-medication in this study. Generally, factors like rural location of settlement, having a child who slept under LLIN a night before the survey and lack of knowledge on malaria transmission were associated with mothers delaying seeking advice or care for treatment of fever episode in under-five children within 48 hours of onset.

Different factors dictate why mothers of U5 children will not seek advice for care or treatment of fever within 48 hours of onset. In rural settlements, mothers are likely not to seek care for fever due to their poor exposures to formal education and health information [8]. High proportions of rural settlements have more households with any mosquito nets for sleeping and utilization by U5 children compared with urban settlements. This was directly related to fever episodes in rural U5 children but indirect relationship to mothers seeking advice for care or treatment of fever within 48 hours of onset. Rural mothers have low level of education and those with no knowledge of malaria transmissions were 70% less likely to seek advice early for treatment of fever in under – five children (OR: 0.3, CI: 0.2–0.7). The lack of knowledge on malaria transmission by mothers may possibly account for inappropriate use of available LLIN resulting to high fever episode in rural U5 children. The poor perception of malaria as not a major health problem and not knowing the cause of malaria by urban mothers were the factors associated with not seeking advice for care or treatment of fever in U5 children within 48 hours of onset.

The rural - urban disparity shows that 'one-size-fits-all' approach to malaria elimination will not be effective but a context specific intervention to drive impact for malaria elimination [4]. It shows that factors responsible to mothers delaying seeking care for fever in U5 children differs in general population compared to and between rural and urban settlements. The type of residence is an event modifier of mothers' characteristics and delay care seeking for fever. Since low education among rural dwellers accounted for high U5 fever episode and not seeking care for febrile children [1], health education, health literacy campaigns, community sensitization to improve mothers understanding of fever and appropriate use of LLIN will be of help. Whereas in urban mothers, having formal education was associated with the practice of home self-medication for fever episode in U5 children.

For Igabi LGA to achieve greater impact in malaria elimination program, different interventions for behavioural change should be implemented in rural areas with high burden of U5 fever episode. Therefore, using a strategic information to drive high impact for fever treatment in rural areas that has high burden of U5 children with fever and mothers delaying care seeking for fever in U5 children, will reduce the number of children dying of malaria [4].

The demographic characteristics in this study were similar to the 2018 Nigeria Demographic Health Survey (DHS) [3]. Further strength of this study lies in the large sample size, being a community survey with sample size well spread in urban and rural settlements of Igabi LGA. The study may not be without any limitations. It may not be generalizable to Kaduna state's populations, prone to social desirability, and information bias. The information on the last child or youngest child of the mothers were collected to minimize information bias and participants were encouraged to speak the truth, assured of their confidentiality and that no consequences if they declined to participate. Moreover, the findings are useful for the LGA wherein this study was carried out. Despite these limitations, this study is valuable to identify areas with high burden of fever episode for intervention that will yield high impact for malaria elimination in the LGA.

## Conclusions

Generally, disparity existed between fever prevalence in U5 children, care-seeking practices by their mothers, and factors associated with delayed care seeking for fever. The differences in rural-urban mothers' characteristics factors will influence care-seeking. To rapidly scale up fever treatment for high impact on malaria elimination, the LGA and sub-national Malaria Elimination Program should employ context specific interventions rather than 'one-size-fits-all' approach for malaria elimination strategy in Kaduna State, Nigeria.

## Abbreviations

LLIN  
Long-Lasting Insecticidal Nets  
LGA  
Local Government Area  
WCBA  
Women of child-bearing age  
MIS  
Malaria Indicator Survey  
WHO  
World Health Organization  
UNICEF  
United Nations Children's Fund

## Declarations

### Ethics approval and consent to participate

Ethical approval referenced MOH/ADM/744/VOL.1/326 was obtained from the Ethical Review Committee of Ministry of Health, Kaduna State, Nigeria. The LGA's Director of the Primary Health Care granted verbal

permission and directed the ward focal persons in charge of the selected settlements to support. Participants were informed of the nature of the survey, benefit and risks, and their right to participate and decline at any time during the interview. We obtained written informed consent from each respondent before the interview but verbally seek the permission from the household head. Participants were assured of their confidentiality and identified using code numbers.

### **Consent for publication**

Not applicable.

### **Availability of data and materials**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

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### **Authors' contributions**

OJB conceived the study and was responsible for its design, data collection, analysis and interpretation; and writing the draft manuscript. OA contributed to conceptualization of the study and the design of its protocol, data interpretation, drafting, formatting and final revision of the manuscript for important intellectual content. IOA contributed to data interpretation and revision of the manuscript for intellectual content. All authors read and approved the final revised manuscript.

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## **References**

1. World Malaria Report 2019. World Health Organization, Geneva: Licence: CC BY-NC-SA 3.0 IGO.; 2019. Licence: CC BY-NC-SA 3.0 IGO.
2. National Malaria Elimination Programme (NMEP), National Population Commission (NPopC), National Bureau of Statistics (NBS) and II. Nigeria Malaria Indicator Survey 2015: Key Indicators. NMEP, NPopC, and ICF International. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC, and ICF International; 2016.
3. ICF. NPC (NPC) [Nigeria] and. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA; 2019.
4. World Malaria Report RP to EM. High burden to high impact: a targeted malaria response [Internet]. WHO/CDS/GMP/2018.25.Rev.1. Geneva; 2019. Available from: [www.who.int/malaria%0Ahttp://www.publish.csiro.au/?paper=EC12504](http://www.who.int/malaria%0Ahttp://www.publish.csiro.au/?paper=EC12504)
5. World Helth Organization. WHO informal consultation on fever management in peripheral health care settings: a global review of evidence and practice [Internet]. Geneva 27, Switzerland.; 2013. Available from: [https://apps.who.int/iris/bitstream/handle/10665/95116/9789241506489\\_eng.pdf?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/95116/9789241506489_eng.pdf?sequence=1)
6. Alex-hart BA, Frank-briggs AI. Mothers' Perception of Fever Management in Children. Niger Heal J. 2011;11(2):69-72-72.
7. Lovelyn O-NA, Betrand NO, Godswill N. Family and Social Determinants of Health-seeking Behaviour of Caregivers of Febrile Children in an Urban City of South-Eastern Nigeria. Arch Med. 2016;08(04):1-6.
8. Ebidor UL, Augustine OA. Parental perceptions and home management of pyrexia in children in a malaria endemic area. Int J Med Med Sci. 2015;7(2):20-5.
9. Ajayi IO, Nsungwa-Sabiiti J, Siribié M, Falade CO, Sermé L, Balyeku A, et al. Feasibility of Malaria Diagnosis and Management in Burkina Faso, Nigeria, and Uganda: A Community-Based Observational Study. Clin Infect Dis. 2016;63(suppl 5):S245-55.
10. Birhanu Z, Abebe L, Sudhakar M, Dissanayake G. Malaria Related Perceptions , Care Seeking after Onset of Fever and Anti-Malarial Drug Use in Malaria Endemic Settings of Southwest Ethiopia. 2016;7:1-20.
11. Chinkhumba J, Chibwana A. Responses of caregivers to children under the age of five with fever and living in areas where malaria is endemic: a systematic review of qualitative studies. JBI Libr Syst Rev. 2010;8(13):520-88.
12. Oluchi SE, Manaf RA, Ismail S, Udeani TK. Predictors of health-seeking behavior for fever cases among caregivers of under-five children in malaria-endemic area of Imo State, Nigeria. Int J Environ Res Public Health. 2019;16(19):1-10.
13. Pierce H, Gibby AL, Forste R. Caregiver Decision-Making: Household Response to Child Illness in Sub-Saharan Africa. Popul Res Policy Rev. 2016;35(5):581-97.
14. Hamooya BM, Chongwe G, Dambe R, Halwiindi H. Treatment-seeking behaviour for childhood fever among caretakers of Chivuna and Magoye rural communities of Mazabuka District, Zambia: A

- longitudinal study. *BMC Public Health* [Internet]. 2016;16(1):1–7. Available from: <http://dx.doi.org/10.1186/s12889-016-3460-8>
15. Aigbokhaode AQ, Isah EC, Isara AR. Health seeking behaviour among caregivers of under-five children in Edo. *Seejph*. 2015;8(February):1–10.
  16. Thandar MM, Kyaw MP, Jimba M, Yasuoka J. Caregivers' treatment-seeking behaviour for children under age five in malaria-endemic areas of rural Myanmar: A cross-sectional study. *Malar J*. 2015;14(1):1–10.
  17. Abba Mustapha M, Dahiru Balami A. Parents' and caregivers' attitudes towards malaria, and health care seeking practices for their febrile children in a hospital in north-eastern Nigeria. *Adv Heal Behav*. 2019;2(1):69–74.
  18. Oluchi SE, Manaf RA, Ismail S, Udeani TK. Socio-Demographic Characteristics and Health-Seeking Behaviour for Malaria Treatment among Caregivers of Under-five Children with Fever in Imo State, Nigeria. *Int J Public Heal Clin Sci*. 2017;4(6):94–106.
  19. Millar KR, McCutcheon J, Coakley EH, Brieger W, Ibrahim MA, Mohammed Z, et al. Patterns and predictors of malaria care-seeking, diagnostic testing, and artemisinin-based combination therapy for children under five with fever in Northern Nigeria: A cross-sectional study. *Malar J*. 2014;13(1):1–12.
  20. Do M, Babalola S, Awantang G, Toso M, Lewicky N, Tompsett A. Associations between malaria-related ideational factors and care-seeking behavior for fever among children under five in Mali, Nigeria, and Madagascar. *PLoS One*. 2018;13(1):1–15.
  21. Aung T, Lwin MM, Sudhinaraset M, Wei C. Rural and urban disparities in health-seeking for fever in Myanmar: Findings from a probability-based household survey. *Malar J*. 2016;15(1):1–8.
  22. Babalola OJ, Sambo MN, Idris SH, Ajayi IOO, Ajumobi O, Nguku P. Factors associated with utilization of LLINs among women of child-bearing age in Igabi, Kaduna State, Nigeria. *Malar J* [Internet]. 2019;18(1):1–9. Available from: <https://doi.org/10.1186/s12936-019-3046-x>
  23. International. NPC (NPC) [Nigeria] and I. Nigeria Demographic and Health Survey 2013. Ndhs. Abuja, Nigeria, and Rockville, Maryland, USA: NMEP, NPopC, and ICF International; 2014.
  24. Measure DHS. Malaria Indicator Survey Interviewer's Manual. ICF Int. 2013;
  25. Measure DHS. Malaria Indicator Survey Model Household Questionnaire. ICF Int. 2012; (December):1–19.
  26. Aderaw Z, Gedefaw M. Knowledge, Attitude and Practice of the Community towards Malaria Prevention and Control Options in Anti-Malaria Association Intervention Zones of Amahara National Regional State, Ethiopia. *J Trop Dis*. 2013;1(3):1–7.
  27. Ruberto I, Camara S, Banek K, Loua MK. Knowledge, attitudes and practices of malaria control among communities from the health district of Forécariah in the Republic of Guinea, West Africa. *J Vector Borne Dis*. 2014;51(June):119–27.
  28. Kassile T, Lokina R, Mujinja P, Mmbando BP. Determinants of delay in care seeking among children under five with fever in Dodoma region, central Tanzania: a cross-sectional study. *Malar J* [Internet]. 2014;13(348). Available from: <http://www.malariajournal.com/content/13/1/348%0ARESEARCH>

29. Ahmed LA, Akinboboye O, Ilesanmi OS, Oguntuase DA. Home management of malaria among caregivers of under-five children in Owo, Ondo State, Nigeria. J Heal Soc Sci [Internet]. 2017;2(3):309–22. Available from: [http://journalhss.com/wp-content/uploads/jhss23\\_309-322.pdf](http://journalhss.com/wp-content/uploads/jhss23_309-322.pdf)

## Figures

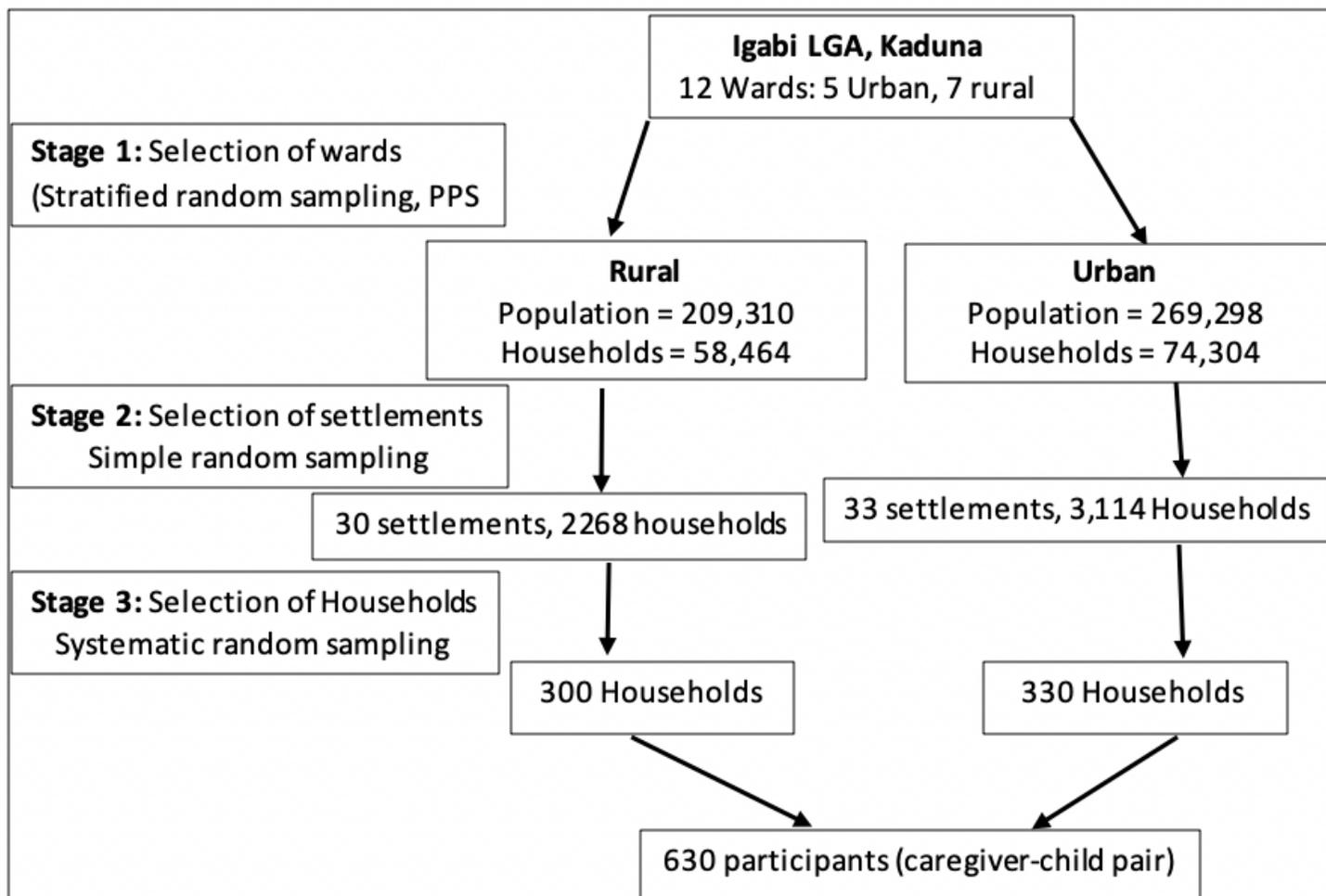


Figure 1

Schematic representation of sampling technique