

Economic Impact of Malaria Treatment on Resource-constrained Households in Akwa Ibom: A Case Study on Selected Local Government Areas

Nsikan Affiah^{1,*}, Sunkanmi Fadoju², Idara James³, Ndifreke James⁴, Chimankpam Uzoma¹, Emmanuel Opada⁵, Joseph Jasini⁶

¹Faculty of Public Health, University of Ibadan, Ibadan, Nigeria

²Creative Associates International, Abuja, Nigeria

³Department of Computer Science, Akwa Ibom State University, Ikot Abasi, Nigeria

⁴Action Against Hunger, Potiskum, Nigeria

⁵Victoria County Public Health Department, Victoria, USA

⁶International Centre for AIDS Care and Treatment Program, Yola, Nigeria

Email address:

afixilinosky@gmail.com (N. Affiah), sunkanmi.fadoju@gmail.com (S. Fadoju)

*Corresponding author

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Abstract: The burden of malaria on human and economic resources cannot be underestimated. In the Nigerian communities where malaria is endemic, the impact on households results in the loss of resources, time, and health of the household members. Up to 97% of the population in Nigeria live under the risk of malaria and 76% in high transmission areas; 50% of the population estimated to have at least one episode of malaria yearly, with the incidence of about 2 to 4 episodes among children every year. The expenditure on malaria represents over 40% of curative healthcare costs with catastrophic impact on the microeconomic level where households are represented. The study set out to determine the economic cost of treating malaria and the health-seeking behaviour of households in Akwa Ibom State, South-South Nigeria. A cross sectional descriptive study among 640 households across the 3 Local Government Areas of the survey. Quantitative method was used to gather information and collected data were analyzed using SPSS software with the result on the cost of malaria treatment estimated using the prevailing interbank exchange rate of 197 Naira per SDU in 2015 and 379 in 2021. The results showed that 55.7% of households preferred visiting drug stores for malaria treatment. Total cost was made up of 44.7% of direct cost and 55.3% of indirect cost, with average direct cost of malaria treatment per household estimated at 8,563.77 Naira (22.60 USD) and the average indirect cost of treatment per household estimated at 10,437.09 Naira (27.54 USD). Average total cost for each episode (888) of malaria was estimated at 9,305.51 Naira (22.55 USD) while at the household level, the average total cost was estimated at 18,868.10 Naira (49.78 USD). In conclusion, low-income households spend 36% of monthly household income on treating malaria compared to high-income households with spending of only 1.2%. The cost of malaria treatment is well beyond the means of the households and given the reality of repeated bouts of malaria and its contribution to the impoverishment of households necessitating increase investment in treatment and preventive intervention.

Keywords: Malaria, Household, Cost, Income

1. Introduction

The fact that 97% of the population in Nigeria still live

under the risk of malaria and 76% in high transmission areas is a clear sign that more needs to be achieved in malaria eradication in the country [1-3]. Malaria remains one of the

major causes of sickness and death for members of the households especially children under the age of 5 years and pregnant women who are most susceptible [4].

Past studies revealed that countries in Africa with high level of poverty tend to record greater incident of malaria as compared to richer countries although this seems to be more of an effect and not the cause [6]. According to the Nigeria Bureau of Statistics (2020), the level of poverty in Nigeria is estimated at 40.1% and this high level of poverty is one of the major burdens to prevention and treatment of the disease [7]. In low-income households, the burden of malaria appears to be more significant, as available income is often spent on various preventive and treatment measures [5]. The implication is that this might lead to a trade-off between spending money on basic needs of life and malaria-related expenditure. The growth of human capital is negatively affected over a long period [8, 9].

In 2020, Nigeria was said to have 27% global malaria cases making it the highest number globally and accounted for 23% of global malaria deaths: highest global malaria-related deaths [4]. In many communities where malaria is predominant, the demands of malaria on the human and economic resources of these communities cannot be underrated and the effect of this on the households might be massive. The cost of Malaria has led to the economic loss of over N132 billion Yearly, the impact of this is mainly experienced in households where malaria ailments account for 46% therapeutic health care cost [1]. Looking at a long-term outcome over an 8 year period, the economic cost of malaria ailment in Nigeria diminished from 13.3% of the GDP in 2003 to 7.3% in 2011 [10]. This negligible reduction has little respite on household revenue; moreover, there is a constant loss of household assets, time, and total well-being, which is due to the expenses spent on malaria prevention and therapeutic procedures [5].

The constant privation of economic and human resources due to this ailment warrants swift action that could help lessen the burden of malaria in the households. To adequately address the effect of malaria, there is a need to estimate the cost of malaria on the economy as it directly affects the households [11].

There are various methods used to estimate the economic cost of malaria, these include the cost of illness approach (COI) and the cost of effectiveness approach and others. The cost of illness study could be incidence-based or prevalence-based study, which estimates the economic demand of the ailment on the society over a period because of the widespread of such diseases. The constituents of prevalence-based cost involve estimation of direct and indirect cost, which is established on their aptness to estimate the economic demand of an ailment [12-14].

The components of direct cost include cost of transportation to the health facility, cost of consultation by the health personnel, cost of drugs procured, amount spent on laboratory tests; these are categorized under direct cost. The indirect cost measures the loss of time of productivity during the period of illness, the impact of the ailment on the head of household's or caregiver's ability to be productive and working days skipped

due to the ailment [13-15].

There are important reasons for focusing on economic cost of malaria on households in south-south Nigeria. Despite households spending substantial resources on different modes of malaria treatment, there is limited information on the cost of the illness in the area. The consequence of this occurrence is grave on these households, as studies have proven that malaria illness hurts household income as it results in loss of resources, time, and health of the household members [10]. The objective of this paper was to determine the treatment seeking behaviour of the households, estimate the cost of malaria treatment in households.

2. Method

2.1. Study Design

A cross-sectional study was conducted in 3 Local Government Areas (LGAs) in Akwa Ibom within 4 weeks in May 2015. Structured pretested questionnaire to estimate the economic cost of malaria at household level in the state using Cost of Illness approach, which involved the estimation of the direct and indirect cost of malaria treatment.

2.2. Study Population/Area

The study was conducted across selected households in Uyo, Eket, and Ikot Ekpene Local Government Areas in Akwa Ibom state. Participants consisted of heads of households or their spouses or an adult representative of households who were interviewed in their houses.

2.3. Sample Size

A total of 640 households were randomly selected for the study. A multi-stage sampling technique was adopted. In the first stage Eket, Uyo and Ikot Ekpene LGAs were randomly selected from the 31 Local Government Areas in the state through the use of simple random sampling method. In the second stage, two wards were selected from each of the three selected LGAs using simple random method, and this resulted in a total of six wards.

Simple random method was also used to select two clusters (communities) from each ward, giving a total of 12 clusters. Systematic sampling method was then used in the fourth and final stage to select the sample households from the 12 clusters with the help of the PHC house numbering system.

2.4. Data Collection and Analysis

Data was collected using Interviewer administered questionnaire adapted from past publications [16, 17]. The head of the household or their spouses, or a representative was interviewed. Data entry and analysis were done using Statistical Package for Social Sciences (SPSS) version 21.

2.5. Estimating Direct Malaria Cost

Using an exchange rate of 197 Naira to 1 US Dollar at the

time of sample collection which was adjusted using 379 Naira the rate as of February 2021 [7]. Direct cost of treatment was estimated by summation of the amount obtained from all the components of direct cost which include, cost of drugs purchase, cost of diagnostic test, cost of treatment from a health facility (private/public) and cost of transportation to health facility/drug store. This estimate was computed based on data obtained from households in each local government areas in the state.

Average direct cost for households was estimated by dividing the total direct cost by the number of households who sought treatment while average direct cost for each episode of malaria was estimated by dividing total direct cost by the total number of episodes.

2.6. Estimating Indirect Malaria Cost

The total number of sick days due to malaria illness by the members of the households (head of household and other members) was estimated by summing all the days that the members were sick because of malaria illness. Number of productivity days' loss by heads of households was estimated by summing the number of workdays missed by breadwinner of the family due to malaria illness. The result of this was used to estimate the indirect cost of malaria treatment by multiplying workday loss by average daily income of heads of households for such loss production days. The average indirect cost for household and episodes was estimated by dividing total indirect cost by number of households and episodes respectively.

2.7. Estimation of Total Cost of Malaria Treatment

Total cost of treatment is a summation of direct cost of treatment and indirect cost of treatment. Adjustment for inflation is usually required when the cost of an intervention occurs over multiple years. This adjustment is based on Consumer Price Index (CPI). The cost of malaria for January 2021 was adjusted from May 2015 when the initial data was collected to reflect the present exchange rate of 379 Naira. The formula used is as follows.

$$\text{Adjusted Cost} = \frac{\text{CPI}(2021) \times \text{Estimated Cost}(2015)}{\text{CPI}(2015)}$$

2.8. Ethical Approval

Ethical approval was obtained from the UCH/University of Ibadan Ethics Review Board. Informed consent was obtained from each Head of households or their spouses or any adult member of the household before administering any questionnaire. Participation of any household member was voluntary and those who decided to decline during the study were permitted to do so.

3. Result

The result showed 94.2% response rate from the 640 questionnaires administered. Households evenly distributed between rural and urban communities with just 7.3% of all the households located in the semi-urban areas.

Table 1. Socio-demographic characteristics of respondents (N=603).

Characteristics	Uyo n (%) N=197	Eket n (%) N=213	Ikot Ekpene n (%) N=193	Total (%) N=603	X ² p-value
<i>Age Group (in years)</i>					
18-25	33 (16.7)	42 (19.7)	14 (7.03)	89 (14.8)	17.033 (0.049***)
26-35	49 (24.9)	64 (30.0)	41 (21.2)	154 (25.5)	
36-45	70 (35.5)	58 (27.2)	44 (22.8)	172 (28.5)	
46-55	46 (23.4)	41 (19.2)	40 (20.7)	127 (21.1)	
≥56	14 (7.1)	15 (7.0)	32 (16.6)	61 (10.1)	
<i>Sex</i>					
Male	103 (52.3)	94 (44.1)	77 (39.9)	274 (40.7)	1.941 (0.379)
Female	94 (47.7)	119 (55.9)	116 (60.1)	329 (59.3)	
<i>Marital status</i>					
Single	80 (40.6)	58 (27.2)	71 (36.8)	209 (34.7)	1.546 (0.462)
Married	117 (59.4)	155 (72.8)	122 (63.2)	394 (65.3)	
<i>Level of education</i>					
None	3 (1.5)	10 (4.7)	3 (1.6)	16 (2.7)	52.562 (0.000***)
Primary	12 (6.1)	48 (22.5)	18 (9.3)	78 (12.9)	
Secondary	82 (41.6)	87 (40.8)	93 (48.2)	262 (43.4)	
Tertiary	100 (50.8)	68 (31.9)	79 (40.9)	247 (41.0)	
<i>Size of family</i>					
1-3	72 (36.5)	47 (22.1)	70 (36.3)	189 (31.3)	1.866 (0.125)
4-5	79 (40.1)	77 (36.2)	63 (32.6)	219 (36.4)	
6 and above	46 (23.3)	89 (41.8)	60 (31.1)	195 (32.3)	
<i>Place of residence</i>					
Rural	64 (32.5)	86 (40.4)	124 (64.2)	274 (45.4)	23.443 (0.011***)
Urban	133 (67.5)	127 (59.6)	25 (13.0)	285 (47.3)	
Semi Urban	-	-	44 (22.8)	44 (7.3)	

*** p< .01, ** p< .05, * p< .1

Table 1 above depicts that majority (54%) of the respondents were between the age of 26 and 45 years, 209

(34.7%) of the respondents were single while 394 (65.3%) were married. A total of 247 (41%) of respondents had tertiary

education, 262 (43%) had secondary education, 78 (12.9%) had primary education and 16 (2.7%) had no formal education. Household sizes varied from between 1-3 members 189 (31.3%), 4-5 members 219 (36.4%), and 6 members and above (32.3%), with mean number of members of all the households being 6 members.

Table 2. Average monthly income of heads of households in Naira (N=603).

Income class	Uyo (n)	Eket (n)	Ikot Ekpene (n)	Total	%
≤ 50,000	123	163	129	415	68.8
51,000-100,000	50	27	46	123	20.5
101,000-150,000	19	14	14	47	7.8
151,000-200,000	3	1	2	6	1.0
201,000-500,000	1	2	1	4	0.7
501,000-1000,000	1	0	0	1	0.2
No response	0	6	1	7	1.2

Table 2 shows the average income by the heads of the household who were the primary respondents in the study. 68% of households interviewed earned 50,000 Naira and below; only 0.2% of households represented in the study earned between 501,000-1000,000 and these household were in the urban areas.

3.1. Knowledge of Malaria

Up to 91.2% of these household identified malaria as the most common sickness in their communities. Other diseases mentioned by the respondents included typhoid fever, HIV, Eye problems etc. Households also identified fever as the most common symptom of malaria, with headache, body pain, cold, diarrhea and vomiting among other common symptoms mentioned by respondents. On the causes of malaria illness, 82.4% of respondents reported mosquito bite as the major cause of malaria illness.

Table 3 shows environmental sanitation 340 (56.4%) and sleeping under ITN or LLIN 339 (56.2%) to be the most common ways to prevent malaria as identified by the respondents and this represent more than half of the respondents. 16.9% respondents also mentioned the use of antimalarial drugs, 21 (3.5%) eating special diet, 108 (17.9%) indoor residual spray, 5 (0.8%) herbal/traditional treatment while 61 (10.1%) were either not sure or don't know any

preventive measure for malaria. Other measures that could be used to prevent malaria identified by remaining 9 (1.5%) of the respondents included fumigation, exercising, mosquito coils, and boiling water.

Table 3. Reported knowledge of malaria prevention measures (N=603).

Preventive measures	N	%
Environmental sanitation	340	56.4
Sleeping under ITN or LLIN	339	56.2
Indoor residual spray	108	17.9
Antimalarial drug	102	16.9
Eating special diet	21	3.5
Herbal/Traditional	5	0.8
Don't know/Not sure	61	10.1
Others (fumigation, etc.)	9	1.5

3.2. Malaria Episode and Treatment Seeking Behavior

Up to 72.6% (438 HH) of the households reported at least one malaria episode during the month preceding the study. The study also shows that a total of 888 episodes occurred across all the households, with a mean (SD) of 2 (1.14) episodes per household during the period in review; of these episodes 172 (19.4%) occurring in infants, 201 (22.6%) in children, 98 (11%) in teenagers and 417 (47%) in adults. Also, 441 were males while 447 were females. The results also indicated that there was significant relationship (p<0.05) between household size and malaria episode. As households with more members, are likely to record more cases of malaria compared to smaller households with few members.

Majority of households, 273 (62.3%) reported the use of clinical symptoms to recognize malaria illness. The most common symptoms among others identified by the respondents were fever 268 (44.4%), headache 200 (33.1%) and body pains 97 (16.1%). Besides the self-diagnosed cases, 164 (37.5%) mentioned that they underwent diagnostic test although most of them could not remember if it was microscopic test or RDT. Of the 431 households with episodes of malaria that sought treatment, 174 (40.4%) used Artemisinin Combination Therapy (ACT), 59 (13.7%) artesunate, 16 (3.7%) Fansidar, 15 (3.5%) chloroquine, 7 (1.6%) quinine and 15 (3.5%) herbal treatment.

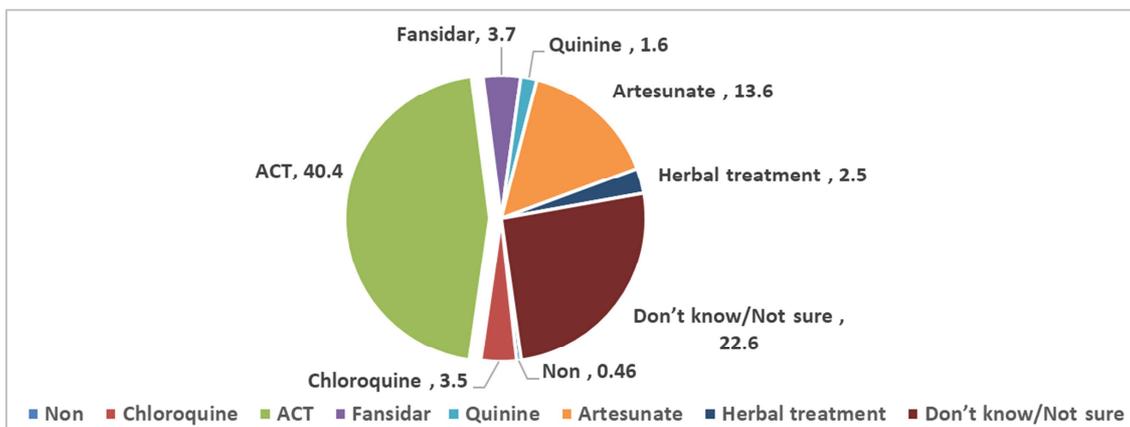


Figure 1. Antimalarial drug choice for episodes of malaria by Household.

3.3. Transportation to the Place of Treatment

Of the 431 households who sought treatment for malaria incidence, only 206 (47.8) made extra expense on transportation to the place of treatment. Others reported that they walked to their places of treatment. The various forms of transportation used were motorcycle 136 (31.6%), taxi 51 (11.8%), tricycle 18 (4.2%) and truck/bus 1 (0.2%).

3.4. Direct Cost of Malaria Treatment in Households

The analysis for the different components of direct cost as shown in table 4 indicates that, cost of medical test (RDT & microscopic test) for malaria was 267,150 Naira (1,356.09 USD), cost of antimalarial drug for treatment was 39,210 Naira (199.04 USD), cost of transportation to either medical

laboratory, hospital, drug store or both 58,964 Naira (299.31 USD) and cost of care at health facilities (not including the cost of transportation and medical test but may include cost of drugs), was 1,387,180 Naira (7,041.52 USD).

The direct cost of treatment for households in the three LGAs was estimated at 1,752, 204 Naira (8,894.44 USD) in 2015 but increased to 3,692,290.0 Naira (9,742.19 USD) in 2021. The average direct cost per 431 households who sought treatment for malaria was estimated at 4,064 Naira (20.6 USD) in 2015 and increased to 8,563.77 Naira (22.60 USD) in 2021, while the average cost of all the episodes (888) of malaria reported by households that sought treatment for malaria was estimated at 1,979 Naira (10.05 USD) in 2015 which increased to 4,170.20 Naira (11.0 USD) in 2021.

Table 4. Result of the components of direct cost in Naira (2015 =1,752,204), (2021 = 3,692,290.0).

Direct Cost	Total 2015 (Naira)	Total 2015 (USD)	Total Adjusted Cost 2021 (Naira)	Total Adjusted Cost 2021 (USD)	%
Cost of medical test: (n)	267150	1,356.09	562945.45	1,485.34	15.2
Cost of antimalarial drug: (n)	39210	199.04	82624.34	218.01	2.2
Cost of transportation: (n)	58964	299.31	124,250.48	327.84	3.4
Cost of care at health facilities: (n)	1387180	7,041.52	2,923101.91	7,712.62	79.2

3.5. Indirect Cost of Malaria Treatment in Households

From the results of analysis, the total number of sick days due to malaria by the heads of the households during the month in review was estimated at 1,048 days. Other members of the households also recorded 3,329 sick days due to malaria illness.

Average number of sick days by the heads of all the households that reported incidence of malaria sickness was estimated at 2.4 days while that of other members of the households was 7.6 days. This gives an average of 10 sick days for each household that recorded malaria episode. Hence, the number of workdays lost by the heads of the households either by their own malaria illness or the illness

of other members of the household was estimated 1074 days which represents 24.5% of the total sick days by all members of the entire household. Hence, indirect cost which was estimated from number of workdays lost by the heads of households due to malaria illness was 2,169, 523 Naira (11,012.81 USD) in 2015 but is estimated at 4,571,675.51 Naira (12,062.47 USD)

The average indirect cost for all the 438 households that recorded episode of malaria was estimated at 4,953 Naira (25.1 USD) for 2015 and 10,437.09 Naira (27.54 USD) in 2021 while the average cost for each 888 episodes of malaria was 2,443 Naira (12.4 USD) 2015 and 5,147.95 Naira (13.58 USD) by 2021.

Table 5. Number of sick days due to malaria by household members.

Categories of Household Members	Average Number of sick days (N=10)	Total sick days (N=4377)
Heads of households	2.4	1048
Other members of the household	7.6	3329

3.6. Total Cost of Malaria Treatment on Households

According to the result, the total cost of treating malaria which is the total amount that is spent by households to treat malaria illness as of January 2021 is a summation of the direct cost of malaria treatment 3,692,290.0 Naira (9,742.19 USD) and indirect cost of malaria treatment 4,571,675.51 Naira (12,062.47 USD), was estimated at 8,263,965.52 Naira (21,804.66 USD).

The total cost of treatment is made up of 44.7% of direct cost of malaria treatment and 55.3% percent of indirect cost of malaria treatment. The average total cost for each episode (888) of malaria was estimated at 9,305.51 Naira (22.55 USD). At the household level, the average total cost was

estimated at 18,868.10 Naira (49.78 USD). Based on the monthly estimate of average total cost, households with an average monthly in 2015 income of 25,000 will spend up to 36% of their monthly household income in treating malaria while households with average monthly income of 750,500 Naira will spend only 1.2% of monthly household income to treat malaria illnesses.

3.7. Multivariate Analysis: Adjusting for Household Head and Other Adult

To examine if similar result were obtained, ad also comparing the result with the table 5 above. The adjusted logistic regression revealed that only Sex [OR=0.128, p=0.00], educational level [OR=0.893, p=003], family size [OR=0.77,

$p=0.00$] and knowledge of malaria [OR=1.158, $p=0.008$] are significant when adjusted with the result of the Household head. The results from the unadjusted model (Model 5) showed significantly higher odds of using the number of sick

days due to malaria compared to that of the household head with similar variables like Sex [OR=0.02, $p=0.00$], educational level [OR=0.621, $p=0.000$], family size [OR=0.552, $p=0.00$] and knowledge of malaria [OR=0.885, $p=0.003$].

Table 6. *Adjusted Logistic Regression.*

Household head vs Other adults	Odd Ratio.	St. Err.	t-value	p-value	95% Conf	Interval]	Sig
Sex	.148	.03	-9.52	0.00	.1	.22	***
Age	.881	.126	.96	.411	.701	.955	
Educational Level	.893	.119	-0.85	.003	.688	1.159	***
Family Size	.77	.047	-4.26	0.00	.682	.868	***
Average Monthly Income	.869	.072	-1.70	.088	.739	1.021	*
Knowledge of malaria	1.158	.064	2.66	.008	1.039	1.29	***
Constant	148.811	101.086	7.36	0	39.303	563.44	***
Mean dependent var	0.595		SD dependent var		0.491		
Pseudo r-squared	0.162		Number of observations		603.000		
Chi-square	131.801		Prob > chi2		0.000		
Akaike crit. (AIC)	694.067		Bayesian crit. (BIC)		720.479		

*** $p < .01$, ** $p < .05$, * $p < .1$

4. Discussion

In this study, malaria episodes were estimated to be 888 across all affected households, and this represents an average of 2 episodes per household per month. Result also showed that more episodes were recorded in households with more than 4 people.

Findings revealed that although 98.4% of all the households that recorded episodes of the illness sought one form of treatment or the other, more than 50% of the households patronizes drugs stores as the first point of treatment instead of public health facilities and private health facilities. Up to 40.4% of the household proved the use ACT for treatment of the illness. According to the analysis, factors found to influence treatment seeking behaviour of the households were monthly household income, nature of diagnosis, and type of community. Another factor that may have also affected the choice of treatment as mentioned by the respondents may be duration of malaria illness, as studies have shown that the longer the duration of illness the more likely that treatment will be sought in health facility [18].

The direct treatment cost of each episode of malaria in this study, estimated at 3,692,290.0 Naira (9,742.19 USD) represents 6.2% of average household monthly income and the impact of this figure is most felt by low-income earners where the average monthly expenditure on malaria is very high when compared to their income.

Earlier studies have identified average number of sick days loss to malaria illness for each household to be 6 days which constitutes less impact compared to this study where the average number of sick days loss to malaria illness for each household was 10 days which is higher, compared to 6 days recorded in other studies [19, 20]. This has led to the high indirect cost, which was estimated at 4,571,675.51 Naira (12,062.47 USD), representing about 7.6% of average monthly income of all the households. On an average, each household

incurs an indirect cost 4,953 Naira (25.1 USD) during the month to treat all cases of malaria while for each episode of malaria, they spend an average of 2,443 Naira (12.4 USD).

Hence, total malaria cost consisting direct cost malaria treatment and indirect cost of malaria treatment estimated at was estimated at 8,263,965.52 Naira (21,804.66 USD), is made up of 44.7% of direct cost of malaria treatment and 55.3% percent of indirect cost of malaria treatment. The average total cost of treatment per episode of malaria was estimated at 9,305.51 Naira (22.55 USD) while average total cost of treating malaria in each household was 18,868.10 Naira (49.78 USD). The total cost of malaria treatment also represents 13.8% of the average monthly household income which is high considering the amount that an average household requires in a month for upkeep.

5. Conclusion

To properly understand the economic impact of this study on households, it is important to point out that 68.8% of all the households represented in this study earn an average of 25,000 Naira per month. As such, these households will spend up to 36% of their monthly household income in treating malaria only and the impact could be said to be catastrophic. On the contrary, households with average monthly income of 750,500 Naira would spend only 1.2% of monthly household income to treat malaria illnesses.

The cost of illness (COI) of this study shows that indirect cost of malaria treatment is higher than the direct cost of malaria treatment. This may be due to the high economic implications of work-days loss due malaria illness and the impact does not only affect the household level (microeconomic level) but it also transcends to the macroeconomic level where it impacts negatively of the annual expenditure. The high cost of treatment could also be related to the fact that most cases of malaria are not properly diagnosed and as such much money tend to be spent on

malaria than other sickness in the household.

6. Recommendation

The cost of malaria treatment is well beyond the means of the poorest households and given the reality of repeated bouts of malaria and its contribution to the impoverishment of the households, there is a need for policies that makes effective malaria treatment and prevention a priority. As such this study recommends that.

The result indicates that households preferred visit to drug store for treatment, as such there is need to close the gap of RDT use among patent medical vendors (PMV) to diagnose malaria. This will ensure correct diagnosis of malaria before antimalarial drugs are sold to them clients; this will contribute to a reduction in the rising incidence of antimalarial drug resistance.

There is an urgent need to scale up funding for malaria and Initiate programs that increases access to and encourages the use of LLIN, ITN, IRS and IPTp especially at household levels. Finally, policies aimed at reducing out-of-pocket payment for malaria treatment through increasing coverage of health insurance to all households in the community, as well as provision of free malaria curative services should be adopted.

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