Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.4, No.3, 2013

MALARIA BURDEN AND THE EFFECTIVENESS OF MALARIA CONTROL MEASURES IN NIGERIA: A Case Study of Asa Local Government Area of Kwara State.

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Abstract

This study examines the trend of malaria burden and the effectiveness of malaria control measures using Asa Local Government Area of Kwara State as a case study. A total of 1200 households were interviewed using a questionnaire. The study used cost of illness approach to evaluate the burden of malaria. The evaluation was based on private direct costs (PDC) and private indirect cost (PIC) of malaria attack per episode. The findings indicated that 37percent of the population of the studied sample suffered malaria attack with a dependency ratio of 33percentage. An average of about 3 days are lost by sick adult, about 2 days by the caretaker while on the average a sick student misses about 2 school days. The total private direct cost of treatment is ₦375,480 billion, total private direct protection cost is ₦446,070 billion and total private indirect cost is ₦1.409,790 billion. The total cost of malaria illness in Nigeria was estimated to be about ₦2,231.34 billion representing 7.3 percent of the GDP in 2011. Findings from this study also revealed that there has been a significant reduction in the burden of malaria on the economy when compared with the baseline study conducted in 2007. It showed a reduction in the burden of malaria from 13.3 percent in 2003 to 7.3percent in 2011. It is therefore recommended that government should expand the provision of free and highly subsidized insecticide treated mosquito nets. Households should also be enlightened on the importance of control and preventions from mosquito bite by using the control and prevention methods effectively. There should also be an increase in the availability of anti malaria drugs at health facilities and an increase in the access to laboratory services. More qualified health personnel,i.e. doctors and nurses, should be employed by the government in order to reduce pressure on the exiting health personnel and therefore, more efforts are needed in these suggested areas to reduce the malaria burden to the minimum target.

Key words: Malaria burden, Control Measures, Nigeria

1. Introduction

Malaria remains one of the most serious health problems worldwide (Narain, 2008) and it is a major public health problem in Nigeria (Federal Ministry of Health, 2005). It accounts for about 60percent of all outpatient attendance and 30percent of all hospital admissions (FMOH, 2007). Malaria increases the morbidity and mortality rates as well as health problems of developing countries, including Nigeria (Carrington, 2001). In 2001, malaria was ranked the 8th highest contributor to the Global Disability Adjusted Life Year (DALY) and second in Africa (WHO, 2002).

Despite the fact that malaria is a general phenomenon; children and pregnant women are at greater risk of malaria attacks and of suffering long-term after care effects. Evidence from Global Malaria Action Plan (GMAP, 2009) suggests that approximately 25 million pregnant women in Africa are at risk of plasmodium Falciparum malaria and nearly 86percent of Africa total population is at risk in the endemic areas, therefore, it is a serious problem. For Instance in Nigeria, National Malaria Control Programme (NMCP, 2005) reported that a child is sick of malaria between 2 and 4 times in a year and it was estimated that malaria was responsible for nearly 110 million clinical cases and estimated 300,000 deaths per year, including up to 11percentage of maternal mortality. Monetary loss due to malaria in Nigeria is estimated to be about 132 billion naira in terms of treatment cost, prevention and loss of man-hours (FMOH, 2007). In order to retrain malaria epidemic Nigeria Government and International bodies have developed series of control measures.

Thus, it is desirable to investigate the extent of malaria burden and the effectiveness of various malaria control measures in Nigeria. The findings are expected to generate awareness, which could lead to improvement in the level of government participation in the effective prevention and control of malaria in Nigeria. The study is divided into five sections. The first section is the introduction and section two entails literature review. Section

three deals with the research methodology. Section four and five contain discussion of results and conclusion respectively.

2. Literature Review

2.1 The Concept of Economic Burden of Malaria

Malaria attack results in morbidity, disability and mortality (Hussain, et al, 2009). Therefore, the two major costs of malaria disease are: morbidity and mortality costs. Malaria morbidity affects household welfare as a result of an increase in the cost of treatment and prevention of the disease and decline in productivity through lost time. In the case of mortality, losses to households include lost of future incomes and cumulative investment on the dead due to malaria (Alaba and Alaba, 2006). Beside mortality "malaria causes morbidity through fever, weakness, malnutrition, anaemia, spleen disorders and vulnerability to other diseases. Malicious patients also experience asymptomatic parasitemia, acute febrile, chronic debilitation, and pregnancy complications" (Bremen, 2001).

Morbidity costs due to illness can be higher in areas of unstable transmission than elsewhere. For example, the economic burden may be lower in settings where malaria is concentrated among young children than in settings where both adults and children are equally vulnerable to malaria. Household expenditure on treatment is usually highly regressive and consuming a larger proportion of income in the poor households to the extent that slow economic growth limits malaria control funds (Chima, et. al, 2003). There is a vicious cycle of poverty and malaria that diminishes economic opportunities for huge number of people. Malaria is estimated to decrease annual per capita GNP growth by 0.25 to 1.30 percent in tropical countries, after accounting for initial endowments, overall life expectancy, and geographic location (Sachs and Malaney, 2002).

Malaria manifests itself through cycles of fever that occur every two to four days. Severe cases can affect the brain and the kidneys. Progression from initial symptoms to death can take as little as 24 hours (Malaria Foundation International, 2008). Malaria therefore affects the quality of labour, it can also lead to absenteeism, and even though an acute malaria attack might not prevent people from working, it may only reduce the quality or productivity or output (Goodman, et. al, 2000). Absenteeism from work can lead to income losses, particularly in the informal sector, where income is largely dependent on the number of productive hours. Children living in areas of low transmission report more malaria than those in higher transmission settings (Clarke, et. al, 2004)

2.2 Incidence of Malaria

The burden of malaria transmission in the world, especially in underdeveloped countries, like Nigeria, is very large in terms of days lost and deaths. A study in Nigeria by Alaba, et. al (2002) reported that malaria attacks an individual on the average of 10 to14 days of incapacitation. Onwujekwe, et. al (2004), later found that there was an average of one attack of malaria per household during the month prior to their survey. It was estimated that malaria affects three hundred million people every year (United Nation, 2005; Jose and Marta, 2002) and it was also reported by World Health Organization (WHO) in 2008 that over 90 percent of deaths associated with malaria was from Africa as at 2006. Therefore, Malaria has been put as one of the top killers among communicable disease (Sach and Malaney, 2002 and World Bank Report, 2002)

In Nigeria, about half of Nigerian adults have at least one episode of malaria each year and seven (7) out of every 10 patients seen in Nigeria hospitals are ill of malaria (FMOH, 2005). According to World Health Organization (WHO, 2003), some countries with a heavy malaria burden, the disease accounted for as much as 30 to 50 percent of inpatient admissions and up to 50 percent of outpatient visits. Studies in Nigeria have shown that there was increased in number of malaria deaths from 4,123 in 1999 to 6,052 in 2004. As at 2007, reported deaths due to malaria increased to 10,239 for all ages (FMOH, 2007 and WHO, 2008).

"Malaria is one of the principal reasons for poor school attendance in many settings because it accounts for 13 to 15 percent of medical reasons for absenteeism from school" (Holding and Kitsao, 2004). In addition, pregnant women are in the high-risk groups. Roll Back Malaria (RBM, 2005) reported that malaria was responsible for one death out of every ten women died around childbirth and three (3) out of every ten (10) deaths of under five years mortality. Malaria causes severe anaemia, a major factor contributing to maternal

deaths in pregnant women. Malaria in pregnancy also exacts a large damage in terms of infant birth-weight and survival. It also makes its victims more vulnerable to other potentially lethal infections such as acute respiratory diseases and diarrhoea. If malarial anaemia results in blood transfusions, there is also a risk of HIV/AIDS.

Nearly half of the world's population lives in vulnerable areas. Episodes of the disease in Sub-Saharan Africa, which hosts the most deadly malaria-transmitting mosquitoes and the most deadly malaria parasite, account for 54 percent of cases, but 90 percent of fatalities. Children below the age of four in the region account for 82 percent of malaria deaths and Disability Adjusted Life Years (DALYs) worldwide (Breman, et. al, 2006).

Gallup and Sachs (2001) also found that there is a significant relationship between growths in Gross Domestic Product (GDP) per capita and the burden of malaria, they argue that 10 percent reduction in malaria was associated with 0.3 percent higher growth per year. Their result shows that most of the countries with high risk of malaria recorded lower economic growth than the rest of the world.

2.3 Methods of Quantifying Malaria Burden

There are basically three approaches to the measurement of the economic burden of malaria. These approaches were stated clearly in the study by Asante and Okyere (2003) as follows: Production Function Approach (PF); Cost of Illness Approach (COI); and Willingness to Pay Approach (WTP).

Production function Approach (PF) is used to capture the total loss or reduction in output (GDP) caused by malaria morbidity and mortality. The approach postulates that the quantity of a given output that is produced is a function of several factors including the capital stock, labour force and the quality of labour employed (see Asante and Okyere, 2003; Gallup and Sachs, 2001).

Cost of Illness approach is based on Human Capital Method (HCM) which has been widely used to assess the productivity losses from illness or injury as measured by income foregone due to morbidity, disability and mortality (Alaba, et. al, 2006). This approach categorizes costs into direct cost; indirect cost and Intangible cost (see Shepard, et. al, 1991).

Willingness to pay approach (WTP) is an alternative method for valuing the economic burden of a disease. WTP is one of the two subsets of the method of contingent valuation (CV), which makes to be a logical extension of standard welfare economic principle, the principle based on consumer sovereignty (Schelling, 1996). "The rationale behind the WTP is that, it involves asking individuals to state the maximum amount that they would be willing to pay to acquire a service or to prevent an undesirable health outcome" (Jimoh, et. al, 2007). So, just as in COI analysis, income and circumstance could play a role in determining the size of WTP estimates (see Jimoh, et. al, 2007; Felix and Clas, 2005; Onwujekwe, et. al, 2004; Asante and Okyere, 2003).

3 Analytical Framework and Methodology

This study adopted cost of illness (COI) method, one of the standard frameworks for analyzing and quantifying the economic burden of malaria as earlier discussed. The method (COI) has been used in many studies to estimate the malaria burden using household surveys (see Malaney, 2003; Asante and Asenso-Okyere, 2003; Jimoh, et. al, 2004 and Asenso-Okyere, et. al, 2009).

For each episode of malaria, an application of COI approach to measuring the burden of malaria attack requires the determination of Private Direct Cost(PDC), Private Indirect Cost(PIC) and Institutional Cost(IC) such that the total cost of an episode of malaria (COI) is obtained by adding up PDC,PIC and IC such that :

COI=PD+PIC+IC ---------- (1)

However, as most disease burden studies applying COI approach exclude institutional cost and focus on private cost. This study excludes IC and therefore focusses on private cost i.e the COI in this study is measured as:

COI=PDC+PIC ---------- (2)

This approach is commonly implemented with household surveys aimed at determining the COI for an episode of the disease, which is therefore aggregated for the total number of episodes recorded by a household over a given period. Doing this for a sufficient number of households allows the determination of an average COI per episode and per household, which then forms the basis for inference about the COI to the population of interest.

The COI obtained in this study was compared with COI estimate obtained in earlier studies to determine whether or not the disease burden has declined in response to programmes that have been mounted to control or confront it.

3.2 Data Requirement

Typical data requirements for the application of COI approach include: socio-economic information such as household demographic characteristics, income, education etc. It also include households choice of health care providers, frequency of malaria attack and the morbidity profile, including information on the length of malaria illness, method of treatment, method and cost prevention, treatment cost (consultation, drugs etc), travel time and cost. Other information required includes average wage rate or income of the victims and their caretakers, etc.

The required data is collected through a structured questionnaire. The questionnaire used by Jimoh, et. al (2007) for measuring the Economic Burden of Malaria is adopted for this study

3.3 Study Area

This study was conducted in Asa Local Government Area of Kwara State, Nigeria. The local government area is one of the oldest in Kwara State. It was created in 1976. The Local Government area has twelve (12) wards and shares boundary with Osun State in several location. It has an area of 1,286 km ²and total population of one hundred and twenty six thousand, four hundred and thirty five (126,435) residents (census, 2006). Major towns in the local government are Afon, Aboto oja, Ballah, Otte, Alapa, Laduba, Ogbondoroko, Onire, etc. Many educated indigenes in the area are employed in the formal sector and farming remains a major secondary occupation.

3.4 Questionnaire Administration

In selecting the households for questionnaire administration, the local government was first demarcated into three districts (Afon, Onire and Owode district). From each district, four villages are picked, in all, 12 villages are sampled. 100 households in each of the selected 12 villages are selected for the administration of the questionnaires. A total of 1200 households were interviewed using the questionnaire and their responses were recorded by the interviewers. Trained interviewers/enumerators were used in the LGA to help in the gathering of data during the interview session with each household. The interviewed households within each selected villages are selected systematically such that after the first household, every 10 is selected until the target for the village is covered.

In each household, a screening interview was conducted to identify households that had experienced any illness during the last one month. The respondents are then asked to describe the major symptoms experienced by the victims. This is to verify that the reported illness is indeed malaria and to be sure that the illness occurred during the last one month prior to this survey. The interview continues for those households that satisfied the conditions and terminated if otherwise.

3.5 Data Analysis

The responses of the respondents were analyzed using descriptive statistics of frequency counts, means and simple percentages; the computations were done using SPSS and Microsoft Excel Spreadsheets.

In the analysis, private direct costs (PDC) and private indirect cost (PIC) of malaria attack were measured per episode and added up to arrive at the total cost of malaria (COI). The results of the analysis include: total cost for all household covered; total cases observed; total number of households surveyed; total persons in the households' surveyed; total direct prevention cost; total cost of malaria per capita; morbidity rate etc.

From the above, average cost per episode was calculated by dividing the total cost per episode by the total persons in the household surveyed. Average cost per household is also obtained by dividing total cost of all the households covered by total number of the entire household surveyed. In addition, average cost per case is calculated by dividing the total cost to the household by total number of cases observed. In order to measure the output lost, worker-population ratio was used to estimate the proportion of lost time that has consequences for (reduced) output.

Average cost per capita was therefore obtained by dividing total cost for the studied population by the total studied population. The outcomes from the sample are therefore used to project the implications for the population of Kwara state in Nigeria. Based on this field survey, the estimated figures were compared with existing estimates.

4 Discussion of Results

4.1 Summary Statistics of the Respondents

The below Table 4.1 summarizes the characteristics of the household studied

Table 4.1: Characteristics of the Households

Characteristics of the Households	**Mean**	**Std. Deviation**
Family Size	5.2083	1.53810
Number of Male	2.3933	0.99047
Number of Female	2.8842	1.44342
Age under 5 Years	0.2679	0.46591
Age between 5 and 18 Years	0.9447	1.00881
Age above 18 Years	4.0035	1.36186
Household Highest Level of Education(Years)	2.5876	1.32697
Length of Residency (Years)	21.6690	21.41601
Household(Dominant) Religion	**Frequency**	**Percentage**
Christianity	511	44.2 %
Islam	632	54.6 %
Others	14	1.2 %
Household (Dominant) Occupation		
Farming	121	10.5 %
Fishing	52	4.5 %
Trading	211	18.2 %
Clerical	35	3.0 %
Artisan	44	3.8 %
Teaching	296	25.6 %
Students/ pupil/ apprentices	333	28.8 %
Pre-school	35	3.0 %
Unemployed/unoccupied	14	1.2 %
Others	16	1.4 %

SOURCE: Authors' Computation (2011)

Table 4.1 shows that the average household size is 5, with average number of males of 2 and females 3. This shows that the majority of the households studied are females. About four on the average are above 18 years of age. Average Household highest level of education was 3, equivalent to junior secondary education. Average length of stay in their present community by the sampled households is 21years; this shows that majority are not new in their community. Household's dominant religion is Islam (55 percent). The table also shows that majority of the households' members (26percent) engaged in teaching while 18percent are traders. Farmers constituted 11percent while fisher, clerical and artisan are 5percent, 3percent and 4percent respectively, other categories of household occupations are unemployed (1percent), pre - school (3percent) and students/pupil/apprentices (29percent), this gave a dependency ratio of 33percent.

Table 4.2: Characteristics of the Respondents

Demographic Variables	**Proportion of the Total Population (%)**
Sex of the Respondents	
Male	72.5
Female	27.5
Respondent's Marital Status	
Single	34.6
Married	61.8
Other	3.6
Respondent's Religion	
Christianity	43.4
Islam	54.7
Others	1.9
Respondent's Level of Education	
No formal education	0.7
Primary school	14.5
Junior Secondary	36.0
Senior Secondary	30.5
Tertiary	5.0
Others	13.3

SOURCE: Authors' Computation (2011)

Table 4.2 presents characteristics of the respondents studied**.** It shows that the majority of the respondents are male (73percent), most respondents are married (61percent), 55percent are Muslims while 43percent are Christians. Majority of the respondents (36percent) had at least junior secondary education.

4.2 Malaria Prevalence

Table 4.3: Frequency Distribution of Number of Malaria Cases

Number of malaria cases	**Frequency**	**Percentage**
1	932	81.2
2	206	18
3	5	0.4
4	2	0.2
5	1	0.1
6	1	0.1
Total	1147	100

SOURCE: Authors' Computation (2011)

Table 4.3 presents the frequency distribution of malaria cases among the studied households. It shows that about 81percent of the households recorded one malaria episode within the reference period of one month while about 18 percent recorded 2 cases in a month. The reported malaria cases show that the minimum number of cases is one while the maximum is six per household per month; this indicates that most households studied reported a case of malaria attack per household per month.

Table 4.4: Malaria Prevalence/Morbidity Rate

Malaria Prevalence	**Minimum**	**Maximum**	**Sum**	**Mean**
Number of malaria cases	1.00	6.00	1378.00	1.2014
Malaria Morbidity Rate	0.2	2.00	393.71	.3713

Source: Authors' Computation (2011)

The average malaria morbidity rate is 0.37 (Table 4.4). This implies that about 37% of the studied population suffered a malaria attack in a month. A study by Jimoh, et. al (2007) found that about 31 percent of the

population suffered malaria attack while Onwujekwe and Uzochukwu (2005) found it to be as high has over 60 percent in their study.

4.3 Major Methods of Protection and Prevention

Table 4.5: Method of Protection and Prevention

Methods of Protection and Prevention	Frequency	Percentage
Do nothing	34	2.9
Sleep under bed net	73	6.3
Sleep under treated nets	378	32.7
Using Window/ door net	356	30.8
Clearing room with broom	30	2.6
Area spraying	39	3.4
Room spraying (Use insecticide)	29	2.5
Control drainage/ stagnant water	26	2.2
Burns mosquito coil	178	15.4
Others	14	1.2
Total	1157	100

SOURCE: Authors' Computation (2011)

Table 4.5 presents households methods of protection against malaria attacks. This study shows that majority of the households (33percent) uses treated nets. Study by the National Demographic Survey (NDHS, 2003) shows that ITNs coverage was 2.2percent and in another study in 2004 by Onwujekwe, et. al (2004), they found that a total of 14.9percent of the poorest quintiles of the household purchased ITNs while 21.1percent of the top quintile of the household purchased ITNs. This suggests that the use of ITNs has been on increased. Other protection methods show that 31percent of the household use window/door nets and 15percent use mosquito coils. It is only a meager 3percent of the households that protect them self using room spraying (insecticide).

Table 4.6: Reason for Choice of Protection

Reason for Choice of Protection	Frequency	Percentage
Very effective	530	45.8
Availability	218	18.8
Cheaper	156	13.5
Simple and conveniences to use	199	17.2
No side effect	35	3.0
Use by other	19	1.6
Total	1157	100

SOURCE: Authors' Computation (2011)

Table 4.6 shows the reason for choice of methods of protection. It shows that majority (46percent) goes for effectiveness of the methods of protection, followed by Availability (19percent), Simplicity and convenience of method of protection has a percentage share of 17percent while those indicating cost as their reason was 14percent.

4.4 Choice of Health Care Providers

Table 4.7 presents information on the choice of health care providers. It shows that the main treatment sources were: self-medication, herbalist/spiritualist and clinic/hospitals.

Table 4.7: Choice of Health Care Providers

Choice of Health Care Providers	Frequency	Percentage
Do Nothing	34	2.9
Self-medication	476	41.1
Visited spiritualist	102	8.8
Visited herbalist	239	20.7
Visited clinical/hospital	306	26.4
Total	1157	100

SOURCE: Authors' Computation (2011)

About 41 percent of households use home-based care of self-medication, 30 percent used traditional means of herbalist/spiritualist, 26 percent use the modern health facilities of hospitals and health centres /clinics while 3 percent did nothing at all. This suggests that self medication is still the highest mode of treatment among respondents studied and this may be informed by the affordability of the treatment types. Therefore, there is a need for government to make health care affordable and be within the reach of the community.

Table 4.8: Forms of Self Medication

Forms of Self Medication	Frequency	Percentage
Used remaining drug by other members (leftover drugs)	107	17.5
Took drugs belonging to friends and relatives	27	4.4
Purchased drug from store	362	59.2
Took herbal medicine	110	18.0
Others	6	1.0
Total	612	100

SOURCE: Authors' Computation (2011)

Table 4.8 shows the forms of self medication, 59 percent of the household members purchase drug from store, 18percent took herbal medicine during a malaria attack, 18percent used remaining drug by other members (leftover drugs) while 4percent took drugs belonging to friends and relatives. It shows that majority purchase drug from the stores.

4.5 Households Private Direct Costs of Malaria Illness

Table 4.9 shows the mean total cost of malaria treatment by major health care providers. It shows that it costs an average of about ₦224 to treat malaria using self medication compared to ₦326 for herbalist/spiritualist and ₦1,833 for clinic/hospital when admission is involved, while clinic/hospital treatment without admission costs about ₦1,361. In terms of cost, self medication is lower than it's counterparts cost for herbalist/spiritualist and clinic/hospital. This shows that in Nigeria where there is availability and accessibility to drug store, self medication is rampant for the treatment of malaria among studied households' members.

Table 4.9: Average Cost of Treatment by Major Health Care Providers

Cost items(₦)	Self-Medication	Herbalist/ Spiritualist	Clinic/ Hospital	
Transportation cost to the facility		69.29	ĕ	
egistration fee at the facility			200.39	
Consultation fee at the facility		Ŏ ĕ	Ŏĕ ı	
Laboratory cost			ĕ ŏ	
Cost of drug given at the facility		ıI ĕĭŎ	ŏ Ŏĕ ŏ	
Cost drug bought form store	I ŏĕĭŏ		Ŏ ĕI	
Transport to drug store	ŏ ĕĭ		ıŏĕĭŎ	

Cost of admission per day			ŏ ıĕŏı	
Other cost	ıÕĕ ŏ		ŏĕ	
Average total treatment cost[2]	ııÕĕ	Õı ĕ	Iư ŐŐĕŐı	
Estimate value of lost output(N)				
(a) Studied population (N' million)[1,3,5]	Iı ĕ	I ıĕ	IưĬı ĕı	IưŐŐ ĕ
(b) Kwara population (N' billion)[4]	ıĕŐ	ŐĕŏŐ	IŏĕŐŐ	ıĬĕII
(c) Nigeria population (N' billion)[6]	IŐ ĕĬŐ	ıĬıĕ	ŏ ĕ ŏ	IưI ĕ Õ
(d) C above as a percentage of GDP in 2011.[7]	Ĭĕŏ	Ĭĕ	ıĕ I	Õĕ IỲ
(e) Weighted average national cost (N' billion)	ĕI	IĬĕIŐ	ı ĕI	Õ ĕŏ
(f) E above as % of GDP in 2011	Ĭĕı	ĬĕĬŐ	Ĭĕ	Iĕı

SOURCE: Authors' Computation (2011)

The table also presents cost estimates for the studied population. A total of about ₦125.5 million, ₦ 182.9 million and ₦ 1,029.2million are direct treatment costs of malaria by self medication, herbalist/spiritualist and Clinic/hospital respectively. While ₦2.35 billion, ₦3.43 billion and ₦14.33 billion were estimated for Kwara state per annum for the treatment of malaria by self medication, herbalist/spiritualist and Clinic/hospital respectively.

Lastly, the estimated direct cost of treating all malaria cases in Nigeria as a whole per annum is about ₦86.19 billion for self medication and ₦10.13 billion and ₦279.16 billion for herbalist/spiritualist and clinic/hospital treatments respectively. The total private direct cost of treatment of malaria cases in Nigeria per annum, is estimated to be about ₦375.48 billion. This represents about 1.3 percent of Nigeria GDP at current market price for the year 2011.

4.5.1 Private Cost of Protection against Malaria Attacks

Table: 4.10 Cost per Month of Using Protection Methods

Cost per Month / **Protection Methods**	**Sum (In Naira)**	**Mean (In Naira)**	**Std. Deviation**
How much did you spend on Bed Nets	340530.00	1098.4839	931.18810
How much did you spend on Window/Door Net	663880.00	1715.4522	1282.66077
How much did you spend on Area Spraying	36600.00	746.9388	215.69852
How much did you spend on Room Spraying	345230.00	980.7670	826.55998
How much did you spend on Mosquito Coil	167090.00	367.2308	430.41142
How much did you spend on Others	48130.00	496.1856	219.26698

SOURCE: Authors' Computation (2011)

Table 4.10 presents the cost per month of using various protection methods by the studied households. The total protection cost is about ₦1.6 million per month with a population of 6026 persons in the household. This gave a sum of ₦265.5 per head per month (about ₦3,186.2 per capita per annum). For the population of the study area of 126,435 is about ₦402,85 million while for Nigeria population of 140 million, this translates to about ₦446.07 billion per annum representing about 1.5 percent of Nigeria GDP at current market price in 2011.

4.6 Average Time Lost in Seeking Treatment

Table 4.11: Average Time Lost in Seeking Treatment by Major Health Care Providers

ĭ ď Ơ	**Self-Medication**	**Herbalist/ Spiritualist**	**Clinic/ Hospital**
		ĭĕŏ	ĭĕ Ŏ
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SOURCE: Authors' Computation (2011)

Table 4.11 presents a summary of time lost in seeking treatment for malaria by major health care providers. It shows that an average of 0.2 hour, 0.5 hour and 1.1 hours are lost when treatment is being provided by self medication; herbalist/spiritualist and clinic/hospital respectively. Self medication has the least waiting time, less than 30 minutes while clinic/hospital has the highest waiting time of more than one hour. This shows that self medication is more effective in terms of its waiting time.

Table 4.12: Estimated Private Indirect Cost of Malaria Illness by Different Categories of Persons

Cost of items	**Sick Adult**	**Caretaker**	**Sick Student**	**Total**
1.Average number of lost days	2.39 days	2.06 days	1.32 days	
2.Lost Days seeking treatment	0.95 days		0.55 days	
3. Average Total number of lost days	3.34 days	2.06 days	1.87 days	
Estimated value of lost output(₦)				
Studied population (₦ Million)[1,3,5,6,7]	1,124.9	23.15		
Kwara state population (₦ Billion)[4]	14,77	9,11		23,88
Nigeria population(₦ Billion)[8,9]	871,98	537,81		1.41 trillion
above as % of GDP in 2011(current)	2.7	1.81		4.51%

SOURCE: Authors' Computation (2011)

Table 4.12 presents estimate of indirect cost of malaria illness by different categories of persons. The table revealed that an average of about 3 days are lost by sick adult, about 2 days by the care taker while on the average a sick student misses about 2 school days. The total indirect cost of malaria was estimated to be about ₦1,124.9 million for sick adult and about ₦693.85 million for care taker for the studied population. A total of about ₦23.88 billion is estimated for Kwara state per annum while the total indirect cost of malaria for Nigeria is about ₦1.41 trillion per annum, this represents about 5 percent of Nigeria GDP at current market price for the year 2011. This result was similar to that of Leighton and Foster (2003), estimating indirect cost of malaria to be about 5percent of gross domestic product in Nigeria.

4.7 Estimate of Total Cost of Malaria Illness

Table 4.13: Total Cost of Malaria Illness

Cost item	Amount (₦ billion)	As Percentage of GDP (%)
Total Private Direct Cost of Treatment	375,480	1.27%
Total Private Direct Cost of Protection	446,070	1.5%
Total Private Indirect Cost of Malaria	1.409,790	4.51%
Total Private Cost of Malaria Illness	2.231,340	7.28%

SOURCE: Authors' Computation (2011)

Table 4.13 presents total cost of malaria illness. Total private direct costs of malaria are estimated to be about ₦821.52 billion representing 2.7percent of GDP. The result obtained indicates that direct cost was lower when compared with the estimate of private direct costs of about ₦669,957 representing 9.2percent of GDP by Jimoh, et. al (2007).

Total indirect costs on the other hand are estimated to be 1,409.790 billion representing about 4.5percent of GDP. The result agrees with the findings of Jimoh et al (2007), who found that indirect cost was about 4.1 percent of the GDP showing that the percentage share of indirect cost over the years is consistent.

Table 4.14 Comparison of Cost of Malaria Illness with Based Line Study

Cost item	This study(2011) Amount(₦billion)	As Percentage of GDP (%)	Jimoh et al, (2007) Amount (₦ million)	As Percentage of GDP (%)
Total Private Direct Cost of Treatment	375,480	1.27%	284,992	3.9%
Total Private Direct Cost of Protection	446,070	1.5%	384,965	5.3%
Total Private Indirect Cost of Malaria	1.409,790	4.51%	303,910	4.1%
Total Private Cost of Malaria Illness	2.231,340	7.28%	973,867	13.3%

SOURCE: Authors' Computation (2011)

In this study, however, the total cost of malaria illness was estimated to be about ₦ 2,231.34 billion representing 7.3 percent of the GDP in 2011(Table 4.14).Compared with a cost of about ₦ 973, 867 million representing 13.3 percent of the GDP reported in Jimoh, et. al (2007), the result of this study suggests a fall in the cost of malaria illness (treatment and protection cost). Consequently, it can be said that there is a noticeable decrease in the burden of malaria between 2003 when the estimates were first provided and 2011 where this study were carried out. This suggests the malaria control programme of the government of Nigeria and her developments are effective in reducing malaria burden.

5 Conclusion

The results of the study revealed that self medication has the least waiting time, less than 30 minutes while clinic/hospital treatment has the highest waiting time of more than one hour. Furthermore, it shows that malaria contributed to loss of days not only to the economically active patients but also the caretakers and the sick children. In terms of day lost, an average of about 3 days are lost by sick adult, about 2 days by the care taker while on the average a sick student misses about 2 school days.

This study further puts the estimated cost of malaria treatment for the studied population, at about ₦125.56 million, ₦ 182.93 million and ₦1,029.17million by self medication, herbalist/spiritualist and Clinic/hospital respectively while indirect costs of malaria was estimated to be about ₦1,124.9 million for sick adult and about ₦693.85 million for caretakers and the protection cost is about ₦402.85 million in the studied area.

A total private direct cost of malaria in Nigeria is about ₦821,520 billion representing 2.7percent of GDP while about 1.409,790 billion representing about 4.5percent of GDP was the total private indirect costs. The burden of malaria in Nigeria in 2011 is estimated to be about ₦ 2.231,340 billion representing 7.3 percent of the GDP in 2011. From this, it is obvious that malaria imposes significant costs on the affected households. Interestingly, findings from this study revealed that there has been a significant reduction in the burden of malaria on the economy from about 13.35percent in 2003 to 7.28percent in 2011 when the results of Jimoh, et. al (2003), are compared with this study. Major reasons for this may be due to different programmes that had been introduced to reduce the malaria burden in Nigeria, ranging from the provision of free and highly subsidized insecticide treated mosquito nets (ITNs), provision of Intermitted Prevention Treatment (IPT) and Artemisini Based Combination Therapies (ACT) to treat multi drug resistant malaria. More effort is, therefore needed in this area to further reduce malaria burden to the minimum target.

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