Int. j. adv. multidisc. res. stud. 2024; 4(5):747-753

Received: 24-08-2024
Accepted: 04-10-2024

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Socio-economic Costs of Treating Malaria Parasitic Disease in Nigeria: A Household Unit Investigation of Two Local Government Areas in Rivers State, Nigeria

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DOI: https://doi.org/10.62225/2583049X.2024.4.5.3319
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Abstract
This study aims at bringing costs of malaria care to the heart of national health discourse in order to seek solutions to the malaria malaise through empirical evidence to support the proposition. The study examines the significance of socio-economic costs of malaria care on reduction in income of households in Nigeria. A sample of five hundred (500) respondents drawn from patients and health seekers from various health and pharmaceutical facilities within Port Harcourt metropolis, Rivers State, Nigeria were used for this research. The study employs spearman rank statistical correlation coefficient for the analysis. Findings from this study evidenced a significant and negative correlation between socio-economic costs of malaria care and reduction in income of households in Port Harcourt, Rivers State Nigeria at a correlation of -.0841 at 0.000 level of significance, The implications of these findings necessitated the need to address the health challenge posed by malaria as the country's goal of eliminating the incidence of poverty will not be achieved unless effective malaria control and awareness programmes are put in place.

Keywords: Socio-economic Cost, Malaria, Parasitic Disease, Economic Burden

1. Introduction

There are direct and indirect costs associated with malaria diagnosis and treatment which could also be referred to as malaria burden. Malaria and other health burdens are in three dimensions, namely: the health, economic and social burdens. The health burden of malaria is the ill-health and premature mortality associated with malaria. The social burden includes loss in social capital resulting from restriction in movement and networking of people due to fear of contacting malaria. The economic burden is the total loss in output or income that is associated with malaria morbidity and mortality (WHO/AFRO, 2001, Kioko, 2007) [36, 8]. The above narratives led to the choice of the topic of research which is socio-*economic costs of treating malaria parasitic disease among households and individuals in Nigeria.*

Malaria is a long standing global health issue, and many efforts have been made to eliminate and control it. Around the world, 113 countries have eliminated malaria and 34 middle-income and some low-income countries are in the malaria elimination phase. However, most low-income countries in malaria endemic regions of the world are still undergoing malaria control programs (Derjew, 2017) [4]. Globally, 40 countries and territories have been granted a malaria-free certification from WHO including, most recently EL-Salvador (2021), Algeria (2019), Argentina (2019), Paraguay (2018) and Uzbekistan (2018), even WHO has declared China as "malaria – free" after seven decades long, multipronged health strategy that was able to entirely eliminate indigenous malaria cases for four straight years (WHO 2022) [38] but this has not been the case in Nigeria and other developing economies of the world where malaria infection is still much on rampage costing individuals and households huge sums of money in treatment.

As one of the most devastating parasitic diseases in the world, malaria contributes considerably to the poor health situation not only in Nigeria but the whole of Africa continent. The global incidence of the disease is estimated to 350 to 500 million clinical cases annually, resulting in 1.5 to 2.7 million deaths each year in Sub-saharan Africa and parts of Asia (WHO, 1997, 1999, 2000, Kioko, 2007) [23, 24, 34, 8]. About 90% of these deaths occur in young children below the age of five years, who have

not yet acquired clinical immunity, and pregnant women, whose immunity to malaria is temporarily impaired. It accounts for an estimated 25% of all childhood mortality below the age of five years, excluding neonatal mortality (WHO, 1997) [23].

In Sub Saharan Africa (SSA) including Nigeria, malaria is responsible for, between 30 to 50% of outpatient visits and between 10 and 15% of hospital admissions (WHO 2015). In addition, the disease exerts enormous pressure on scarce health resources in SSA countries. In general, it is estimated that malaria account for an average of 3% of the total global disease burden. More evidence points to significantly increasing malaria morbidity and mortality in SSA due to non-adherence to full treatment courses (protocol) namely combination therapy, early diagnosis and prompt effective treatment (WHO 2015).

Ill-health especially the one resulting from malaria infection could contribute to impoverishment of individuals and households. WHO and World Bank report shows that malaria is responsible for an estimated annual loss of 45 million disability adjusted life years (DALYs) worldwide. This was higher than the loss of 39 million DALYs reported in 1998 and more than 36 DALYs in 1999 (WHO, 1998, 1999 [24], 2002, World Bank 1993 [39]). In SSA, more than 10% of all disability adjusted life years were lost to malaria in 2000 (WHO, 2002). It has furthermore being estimated that among the ten leading causes of loss in DALYs in the world in 2000, malaria is ranked eighth with a share of 2.8% of the global disease burden (WHO, 2002, Kioka, 2007 [8]). Recent estimates shows economic losses due to malaria in sub-sahara Africa to over, US dollars 12 billion annually (Gallup & Sachs, 1998, WHO, 2000 [34]). Here malaria exerts a devastating effect on the development potential of SSA countries and mostly affects the disadvantaged and economically susceptible households, who constitute the bulk of economic labourers.

Available data indicates that malaria imposes high and regressive cost burden on household that have a sick family member, with poor household spending, a higher proportion of their income on healthcare than the better-off households (Russell, 2004; Goodman *et al* 2000) [19, 6], (Kioko, 2007) [8]. Further to this expenditure on insecticides, drugs, and equipment, large numbers of malaria patients make health personnel get stretched beyond capacity, thus affecting the standard of care they give to patients. From the above, malaria is a serious problem affecting many sectors of a country economy.

1.1 Research Problem

The economic impact of malaria infection on countries, households and individuals is increasingly becoming a subject of considerable interest to researchers as well as the government. Generally, illnesses resulting from malaria infection and other forms of ill-health could contribute to impoverishment which is defined as depletion in household asset and income loss that cause consumption levels to fall below minimum needs. Emerging evidence from macro-economic studies indicate that malaria endemic countries stand to lose billions of dollars in national income due to the impacts of morbidity and mortality from the disease on labour supply. In Nigeria, malaria has been shown to account for over 40% of the total monthly curative healthcare costs incurred by households compared to a combination of other illnesses. The cost of treating malaria and other illnesses depicted 7.03% of the monthly average of household income, and treatment of malaria cases alone contributed 2.91% of these costs (Onwujekwu *et al* 2000) [14].

Households spending on malaria can be classified into expenditure on prevention and expenditure on treatment. Individual or household direct cost of malaria treatment include direct payment for drugs, consultation, laboratory tests, transportation fees to and from the facility (Asenso-Okyere *et al*, (1997) [2] while the indirect cost is the productive time lost due to malaria. Despite its devastating health effects, empirical evidence of the economic impact of the disease on households in Port Harcourt. Rivers State Nigeria, remain largely unknown and few studies performed did not really captured the socio-economic costs of the disease to the Niger Delta people of Nigeria. Thus, this study fills the knowledge gap that exists concerning the socio-economic costs of treating malaria parasitic disease in Nigeria especially in the Niger Delta region where the disease is rampant due to environmental factors.

1.2 Objective of the Study and Statement of Hypothesis

The broad objective of this paper is to investigate how direct and indirect cost of malaria treatment affects the economy of households and individuals in Port Harcourt, Rivers State, Nigeria. To this end, the main research questions would be to what extent does malaria treatment affect the living and spending income of households? Thus we formulate the accompany hypothesis both in null and alternate forms as:

H_0: There is no significant relationship between socio-economic costs of treating malarial infection and reduction in income of households in Port Harcourt, Rivers State, Nigeria.

H_1: There is a significant relationship between socio-economic costs of treating malarial infection and reduction in income of households in Port Harcourt, Rivers State, Nigeria.

2. Literature Review

2.1 Conceptual Review

Socio-economic Cost of Malarial Care

All health decisions involve economic considerations in form of costs. As such there is a marriage between health and economics and to some extent health and sociology as ill health could negatively affect the ability of individuals to socialize and effectively have engagements with others. Of course these come with costs which may be direct or indirect hence socio-economic costs. Most economic decisions take enormous toll on the income of the family or household, sometimes keeping them poorer than the burden of the disease itself. Reducing the burden of avoidable illness and disability will reduce the human and economic cost imposed on populations (Nwankwo, 2004) [13].

Health Economics and Poverty: The linkage between poverty and ill-health are bi-directional. Ill-health is a major contributor to individual and community poverty. The ill are unable to contribute maximally to the economic and social development of the communities in which they live, despite this decreasing productivity, they must also require resources for their care. Ill-health is a major pauperizing factor (Osibogun, 2014 [15], WHA, 2013). The Osibogun equation emphasizes that cost of illness is beyond the cost of treatment, individuals, families and communities are sent to poverty and are kept there as a result of excessive cost of treatment.

The Osibogun Equation, Illhealth and Poverty

Adopting the Osibogun equation on the correlation between ill health and poverty, we have: CI = CT + CTB + COF + SC + COPM

Where: Cl = cost of illness, CT = Cost of treatment, CTB = Cost of treatment seeking behaviour, COF = Cost of opportunities forgone, SC = Social costs, and COPM – Cost of pain and misery. Investing in health should therefore make sound economic sense as part of that investment if properly applied would save costs that can be incurred due to illness (Osibogun, 2014, Russell, 2004) [15, 19].

Conventional economics conceptualizes and measures poverty in terms of income and expenditure (consumption). Using this approach, the economic burden of illness can be measured using two related indicators:

1. Healthcare expenditure as a proportion of household income (direct cost burden) (Russell, 1996) [18]. Recent studies have clarified healthcare payment above 10% (percent) of income as catastrophic for households, assuming that above this threshold payments are likely to cause cuts to food consumption, debt and impoverishment (Prescott, 1999) [17]. A more refined indicator changes the income denominator to that remaining after basic consumption needs have been met (capacity to pay). A healthy expenditure burden greater that 40% percent) or 50% (percent) of capacity to pay is assumed to be catastrophic for household (WHO, 2000) [34].
2. Production and income loss caused by illness as a proportion of normal income, indirect cost burden. The asset portfolios at peoples disposal, including policy derived resources and less tangible assets like social relationships also influences their ability to cope, or their vulnerability or resilience to shocks such as illness.

WHO handbook defined total costs of health care to consist of direct medical costs (ie administration costs, laboratory tests, X-ray examinations, drug costs, hospitalization costs, and adverse drug effects costs), direct non-medical costs (i.e. transportation, food and the costs of food supplements) and income loss (WHO 2017) [30].

World Health Organization (WHO) in its 2015 publication: Guidelines for the treatment of malaria, third edition listed core principles in the treatment of malaria used by the guidelines development group: (a) Early diagnosis and prompt, effective treatment of malaria – uncomplicated falciparum malaria can progress to severe forms of the disease, especially in the people with no or low immunity, and severe falciparum malaria is almost always fatal without treatment. These imply that programmes should ensure access to early diagnosis and prompt effective treatment within 24 – 48 hours of the onset of the malaria symptoms and there should be rational use of anti-malarias agents.

The WHO (2015) guidelines further recommended the following: (a) diagnosis of malaria: All cases of suspected malaria should have a parasitological test (Microscopy or Rapid diagnostic test (RDT) to confirm the diagnosis both supported by a quality assurance program (b) treating uncomplicated P. falciparum malaria: Treat children and adults with uncomplicated P. falciparum malaria (except pregnant women in their first trimester) with one of the following recommended artemisinin – based combination therapies (ACT):

- Artemether + Lumefantrine
- Artesmuate + amodiaquine
- Artesunate + mefloquine
- Dihydroartemisinic + piperaquine
- Artesunate + sulfadoxine – pyrimethamine (SP).

Duration of ACT treatment is 3 days with an artemisinin derivative.

2.2 Theoretical Review

Health Belief Model

The Health Belief Model (HBM) was developed in the 1950s by social psychologist, Hochbaum, Kegel, and Roseustock to study why people fail to participate in health intervention programmes such as malaria screening, and free health programmes including – tuberculosis andhuman immunodeficiency virus, acquired immunodeficiency syndrome HIV/AID. The HBM is guided by six constructs:

(a) Perceived susceptibility to particular disease
(b) Perceived seriousness of disease.
(c) perceived benefit to taking health action,
(d) Perceived barrier to taking action
(e) Cues to action (readiness to take action) and
(f) Self-efficacy (Glanz, Rimer, & Viswauth, (2008) [5].

HBM originated from the United State public health services; it was included in the study of peoples response to symptoms and adherence of treatment (Glanz *et al* 2008) [5]. Many disciplines showed that influencing behavioural change is difficult as a result, programmes such as health promotion, improve the environment where people live to help enable behavioural changes at an individual level. HBM is widely used by different professions e.g (Nurses, dentists, public health) to study behavioural changes and maintenance of behavior **(Shumaker, S. A., Ockene, J. K., & Riekert, K. A. (Eds.). (2009) [22]. (3rd ed.)**. HBM is based on the belief that people are more likely willing to avoid illness if they believe their specific action will prevent illness.

Health Belief Model

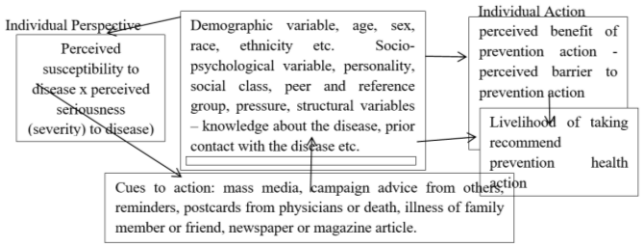

Fig 1: Adapted from the health belief model (from Becker M.h, HacfnerD.P, Kaslsv *et al*, selected psychosocial models and correlates of individual health related behaviours Medicare 1997, 15: 27-46

Explaining the health belief model, Social strata are associated with different values that shape a wide range of people's response to health and illness, behaviour. Social stratification of a society can also be of importance in understanding their pattern of health and illness behaviour (Abanobi, 2010) [1]. This is explained clearly in the figure above.

2.3 Empirical Review

Malaria affects labour supply and social disposition of households. It increases substantially household income shocks and level of production and gross domestic product (GDP) thus imposing substantial social and economic costs impeding economic development through human capital, premature deaths, medical costs and reduction of savings and investments (Lucas 2005 [12], Laxminarayan, 2004, Goodman *et al* 2000 [6], Sachs & Malaney, 2002). Researchers have placed the economic burden on households due to malaria prevention measures to between 0.23US dollars and 15US dollars each month, and between 1.79US dollars and 25 US dollars due to treatment measures (Leighton & Foster 1993 [11], Evans *et al* 1997, Kirigia *et al* 1998 [7], WHO 2002, Kioko, 2007 [8]).

Another, notable health economist and policy researcher, Steven Russell posited that for resource – poor settings, illness impose high and regressive cost burdens on patients and their families. Even in Sri Lanka where public health services are free at the point of delivery, the total cost of all illness was more than 10% of monthly household income. Total cost burden estimates for malaria were less than 10%, but for TB and HIV/AIDS they were catastrophic for households (i.e more than 10%) and indirect costs were usually the dominant cost component. (Russel 2004) [19].

Onyinye, Okoronkwo and Osirim (2024) [16] evaluated the economics of health care in the treatment of malaria infection among households in Nigeria. Findings show that over 47% of the respondents spent between N5,000 to N15,000 each month and N60,000 – N180,000 or average of $120 per year for the treatment of malaria and that represents 5 – 15% of most respondents' annual incomes. The study found evidence of a significant statistical correlation between malarial diagnosis, treatment and household spendable income as well as with mortality rate. They recommended an effective and efficient malaria eradication programmes coupled with the introduction of national health insurance and free malaria treatment schemes to reduce the economic burden of malarial treatment in Nigeria.

3. Methodology

A cross sectional survey research design was adopted to investigate key aspect of the study. Quantitative and qualitative research methods were used. The population of the study comprise male, female, adult and children in household in Port Harcourt City and Obio/Akpor Local Government Areas and those visiting Obio Cottage Hospital Rumuobiokani, Model Primary Health Centre Rumuokwurushi, Model Primary Health Centre, Churchill, Town, AB. Pharmacy Eliparanwa, Evangel Laboratory, Rukpakwusi, Efulecare Pharmacy, Rumuogba in Port Harcourt, Rivers State, Nigeria. The study locations were purposively and randomly selected to reflect geographical spread of population within Port Harcourt metropolis.

3.1 Sampling and Sample Size

The sample size was determined applying this formula:

$$n = \frac{N}{1+N(e)^2}$$

Where

n = Sample size
N = Population
I = A constant
e = Margin of error test of significance.

Target population of patients of 2,200 the sample size of 500 was used for the study, representing 22.7% of the target population which conform with the Cochran formular modified.

3.2 Method of Data Collection

The administration of the instrument was carried out by the researcher with assistance of field officers. They were properly trained and briefed before the administration of the instrument. The researcher and his team visited the sampled hospitals and the sites, selected to administer the instrument. The respondents were given a day to fill the questionnaire. Some were kind enough to ask the researcher to wait to collect them immediately or within manageable period of the day while laboratory staff working with our team filled those that passed through laboratory analysis unit of Obio Cottage Hospital, Model Comprehensive Hospital, Rumuokwurusi and Evangel Laboratory Rukpakwusi. The cooperation from the respondents and field staff enabled the researcher to administer and collect the questionnaire within fifteen months of the field work.

3.3 Validity and Reliability of the Instrument

The research instruments, the laboratory bench work, the questionnaire and key in-depth interview (KII) guide were subjected to validity by two research supervisors expertise team and other experts in the department of Zoology and environmental Biology (ZEB) school of natural science Michael Okpara University, Umudike Umuahia, Nigeria. This was to ascertain the appropriateness of the instrument in coverage, scope, clarity, relevance and content, their comments, contributions, corrections and suggestions were used to improve and enhance the validity of the instrument for the study. On reliability of instrument, the study adopted the test and retest method. This involves first administering 20 copies of the questionnaires to 20 patients and others not used in the study. After an interval of two weeks, the researcher re-administered the same instrument to the same 20 patients and others.

4. Data Pesentation and Analysis

4.1 Presenation of Data

A total of 500 questionnaires were administered and 376 (75%) copies were retrieved from the field. 38 (7.6%) copies were discarded since more than half of the questions were not attended to by respondents. Hence, only 338 (67.6%) copies were actually analyzed for the study.

4.2 Results

As contained in appendix 1 below, 33.4% of the respondents agreed that **Arthemeter**-Lumefatrine was the most commonly used drug in the treatment of malaria infection. 42.8% were also of the view that Arthemeter-Lumefatrine is also used for household health care. The results show that majority of the patients (25.1%) spent between N3,000 to N5,000 for the treatment of malaria every month. Laboratory tests cost between N3,000 to N4,000 as asserted by respondents. Besides, majority (25.1%) takes more than one month before taking malaria treatment; and 1-5 years were most hit by malaria infection (28.1%). The result further indicates that majority of household members come

down frequently with malaria more than 3 months; 5 - 9 % of their income is spent on malaria treatment and they spent more money on malaria medicine. 32.5% responded that the most serious health problem in their community is malaria disease. Besides the direct costs of treating malaria, other indirect costs reveals in the study are loss of time and economic hour. To avoid malaria infection, the most potent way according to the study outcome was the use of insecticides - 23.6%. The result also indicate that the common signs and symptoms of malaria in young children is fever - 17.7%

4.3 Hytothesis Testing and Results

This study is guided by just one hypothesis purposively stated both in the null and alternate forms as follows:

H_0: There is no significant relationship between socio-economic costs of treating malarial infection and reduction in income of households in Port Harcourt, Rivers State, Nigeria.

H_1: There is a significant relationship between socio-economic costs of treating malarial infection and reduction in income of households in Port Harcourt, Rivers State, Nigeria.

Appendix 2 below evidences a significant and negative correlation between socio-economic costs of malarial care and reduction in income of households in Port Harcourt, Rivers State Nigeria at a correlation of -.0841 at 0.000 level of significance, two-tailed. Therefore, this study rejects the null hypothesis and of course accepts the alternate hypothesis and concludes that there is a significant relationship between socio-economic costs of treating malaria infection and reduction in income of households in Port Harcourt, Rivers State Nigeria. This result supports the findings in the reviewed literature especially as in the one of Laxmnarayan (2004) who posited that the economic burden of malaria on households is immense and that there is a high probability that households incur huge loses due to malaria illness thus leading to their impoverishments.

4.4 Result Discussions

This result is robust and interesting as it evidenced and confirms that ill-health can cause household impoverishment through income losses and medical expenses that trigger a spiral of asset depletion, indebtedness and cuts to essential consumption. The work showed poor households spend more due to malaria infections and it is usually frequent. Households afflicted with malaria experience lower outputs than other diseases; the burden exerted by malaria is larger than that inflicted by other diseases. Another finding from the work is that educated individuals are better able to adopt preventive measures in ways that protect them from diseases compared to the less educated ones.

The impact is better explained by Prof Akinsanya Osibogun of the Department of Community Medicine, College of Medicine, University of Lagos, Nigeria in his public lecture at the National Post graduate College in Lagos 2014 called **Osibogun equation:** thus

$$CI = CT + CTB + COF + SC + COPM$$

Where CI = cost of illness, CT = Cost of treatment, CTB = Cost of treatment seeking behaviour, COF = Cost of opportunity forgone, SC = Social Cost, COPM = Cost of Pain and misery (Osibogun 2014) [15].

This shows as evidenced in our result that the cost of illness is well beyond the cost of treatment; households are sent to poverty and are kept there. The poor are likely to be sick and when sick, less likely to access health promptly, increasing poverty level will therefore mean increasing number of sick people, lack of personal resources means they would only seek treatment when condition have become catastrophic, creating desperation. Households from the poorest income quartile experience higher cost burdens then better off groups (Russel 2001). Expenses form the study include malaria medicines, laboratory tests, hospital visits, consultation, return visits, special diets, relatives time caring, farm and office time lost, school work, skill, recreation, spiritual time lost, among other indirect costs.

5. Conclusion, Recommendations and Policy Implication

Malaria remains the leading causes of morbidity and mortality in many developing countries, including Nigeria. In addition to time and financial resources, it exerts adverse impact on income and could lead to poverty. Another important conclusion that can be drawn from the analysis is that malaria result in recurrent debilitating bouts of illness, which prevents individuals from supplying their labour productively. The implications of these results are that the country's goal of eliminating the incidence of poverty will not be achieved unless effective malaria control programmes are put in place.

Recommendations: It is clear that investment in malaria control and education mitigates the economic burden imposed by malaria and increased government expenditure mitigates negative effect of malaria on production, household income and on wage earnings. In view of this, it is imperative that the government considers increasing budget allocations to malaria control measure especially in areas of high malaria transmission. This in the short run may reduce budgetary allocation for other priority area, in the long run, it would be beneficial because reduction in morbidity due to malaria may enable government to reduce the expenditure for medical care, thus releasing funds for other priority areas.

It is imperative that government intensifies public education awareness about the disease transmission and on prevention measures. A higher level of public awareness or education on malaria in general is positively related to the presence of malaria at the household level. Incidence of malaria is higher for less educated households and in regions with poorer preventive health services. Hence, public health interventions which decrease the households' risk of contacting malaria will improve labour productivity and result in higher output levels. Improvements in health infrastructure will particularly reduce the susceptibility of low income households to malaria shocks. Ultimately, these measures are expected to reduce malaria transmission, improve labour productivity, and consequently lead to higher incomes and improvements in the living standard of the people.

6. Ethical Conflict

The authors hereby declare that t here is no ethical conflict in this manuscript.

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