

**Environmental and Human Factors to Effective Prevention of Malaria infection among Residents of Calabar Municipality, Cross River State, Nigeria**

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**Abstract**

The study aimed at assessing environmental and human factors to effective prevention of malaria infection among residents of Calabar Municipality, Cross River State, Nigeria. Three specific objectives were formulated to guide the study. Three research questions were also posed to guide the study which translated to three null hypotheses tested at 0.05 levels of significance. Ex-post facto design was used for the study. Environmental and Human Factors to Effective Prevention of Malaria Infection Questionnaire (EHFEPMIQ) was developed by the researcher and used to elicit information for the study. The sample consisted of 600 respondents drawn from five communities using multi-purpose sampling techniques. Pearson product moment correlation statistical analysis was used for data analysis. Results of the analysis indicated that there was a significant relationship between the use of insecticide treated net, cutting down of overgrown weeds and removal of stagnant water around the surrounding, all lead to prevention of mosquitoes attack thus preventing malaria infection. It was recommended among others that insecticide treated net should be used when sleeping, overgrown weeds should be cut low and stagnant water be removed around the surrounding where people reside.

Keywords: Environmental factors, human factors, malaria infection, mosquitoes

**Introduction and Background**

Malaria is one of the most serious health problems facing the world today. The World Health Organization WHO estimated that over 300 million new cases of malaria occur in a year, with approximately three million deaths resulting from contraction. Malaria is endemic in tropical Africa with an estimated 99% of total malaria incidence and death particularly among pregnant women and children. Malaria is an endemic infection in Nigeria. It is a vector borne disease placed on World Health Organization partial funding for malaria control projects. Oil

companies working in the Niger Delta area, where there are many marshy swamps and high prevalence of malaria contributes to a general malaria control Fund (National Roll Back Malaria Programme, 2011).

Malaria is caused by protozoa in the plasmodium genus vivax which is more prevalent in low endemic area. Among the plasmodium genus vivax, plasmodium falciparum falcipation are most dangerous. The plasmodium facipation has a life cycle in the mosquito, the vector and also in human host. The anopheles mosquito is the vector responsible for the transmission of malaria.

Malaria is an acute and sometime chronic infectious disease cause by protozoa of genus plasmodium species which is transmitted by infected female anopheles mosquitoes. It is one of the major insect borne infection of public health importance which has a worldwide distribution with endemic transmission occurring in many countries. Malaria is found in Nigeria region lying roughly between longitude 60<sup>0</sup>N. In most part of Africa, where environmental factors like temperature, humidity, rainfall, altitude, presence of stagnant water, the presence of bearing plant like paw paw, Cocoyam and banana, bad attitude towards the environment like poor sanitation, not using mosquitoes treated bed net are prevalence, it has contributed to malaria transmission. Other factors considered as human factors such as belief, ignorance and attitude detrimental to sustainable health practices tend to increase the prevalence of malaria in tropical Africa (Lucas and Gills, 2001). Malaria is a serious disease in the tropic and it prevalence rate is high leading to other diseases that kills gradually. Over the decades, it has been estimated that 300-500 million cases of malaria infection occur globally per year, 8% of which occur in Africa. It is estimated that malaria is responsible for one million death per year, virtually due to plasmodium falcipation and 60% of which are in Africa affecting mostly infants and children. In Nigeria, it is estimated that ten new cases occur daily with two death per minute (National Malaria Control Programme, 2011).

Malaria strives in human or physical environment. Asuquo and Ikpeme (2012) noted that environment is the collective term used to describe all the living and non-living things that make up our surroundings. These include the biological, physical and social factors in our surrounding. Thus, the study of the factors in our physical environment which can influence our health is refers to as environmental health.

Malaria is one of the most important causes of morbidity in the world. it is a vector-borne infection disease that can also be caused by eukaryotic Protista of the genus plasmodium. The disease is transmitted by female anopheles which carry infective sporozoite stage of plasmodium parasite in their salivary glands. It is transmitted from person to person through the bite of female anopheles mosquitoes that is infected with one of the species of plasmodium vivax and plasmodium malaria. It affected mostly children under five (5) years and pregnant women because they have weaker immune system (World Health Organization WHO, 2013).

The zoological family plasmodidae contain protozoa found in the blood of birds, reptiles and mammals. *P. falciparum* are found throughout tropical Africa and some temperate zones. *P. ovale* is mainly in West Africa, while *P. malariae* is worldwide but very patchy in distribution (Olise, 2017). *P. falciparum* is responsible for about 80% of malaria infection in humans. Lucas and Gills (2001) stated that the effect of malaria in any given population is influenced by factors which include vectorial, parasites, environmental and the host factors. Malaria is highly endemic in Calabar municipality and it is one of the major causes of death and ill health among the residents. It is one of the most common cause of out-patient visit to the health facilities of clinic, health centre and hospital.

Insecticide treated net is one of the personal protection that has been shown to reduce malaria illness. The use of insecticide treated net form a protective barrier around people sleeping under them, however, bed net treated with insecticide are much more protective than untreated net (WHO, 2013).

Malaria remains a public health concern in Nigeria despite huge global investment in the production and distribution of insecticide treated nets to protect people from plasmodium falciparum parasites. Information on the use of insecticide treated net is needed for designing strategies for its effective usage. Focus group discussions was conducted in 2015 in Calabar South communities in Cross River State. The findings indicated that the people had poor knowledge on the importance of insecticide treated net usage, this resulted in wrong perception about the usage of the nets. They had the notion that insecticide treated net produces heat when it is used as a cover protection. The use of community structures such as traditional rulers, village heads, churches and mosques was suggested as a tool to effective distribution of nets. Sensitization, proper supervision of net distribution and health education were discovered to dispel misconception of the people such as, insecticide treated net could kill, it can reduce human fertility, and that it causes rashes due to excess heat generated (World Health Organization WHO, 2008).

According to Park (2007) the effect of malaria on health and as it affects development of man are enormous. Malaria is an endemic disease in sub-Saharan Africa with high morbidity and mortality rate. It is a dreaded and insidious disease and it is adjudged one of the highest killer diseases in Africa, but it is often ignored, neglected and treated with levity especially now that the world attention is shifted to HIV/AIDS infection. The Government, Non-Governmental Organization and private individuals have adopted measures to control malaria infection. This include the use of insecticide treated net, environmental sanitation activities such as cutting down of overgrown weeds, removal of stagnant water in the surrounding, the use of anti-malaria drug (chemoprophylaxis) and health education.

Olise (2017) noted that malaria has caused adverse effect on health and economic development of the people. Malaria attack has endeared government into making special budgetary allocations to the health sector for procurement of drugs, and the training of personnel. Malaria is seen as an antagonistic disease entity which attack and cause weakness, chills, anaemia, loss

of appetite, jaundice, liver or kidney failure and mental agony this rendering the victims unable to perform the activities for daily living.

National Roll Back Malaria Programme (2011) stated that when mosquito bites someone, that person becomes infected with malaria parasites. Malaria parasite can be transmitted by blood from an infected person to another. Malaria is characterized by a cycle of chills, fever and sweating that reoccur every 1,2,3 days depending on the species involved. The attack of a malaria parasites on a person's red blood cells makes the person temperature rise and the person feel hot. The subsequent bursting of red blood cells make them feel cold, have shivering chills, nausea, vomiting and diarrhea with fever. The destruction of red blood cells can cause jaundice yellowing of the skin or whitening of the eyes and endemic (National Malaria Control Programme, 2011).

Malaria is associated with poverty due to poor sanitary and environmental conditions. The rich and powerful live in sanitary surrounding with easy access to medical facilities. While the poor live in crowded urban slums and remote rural areas which favour mosquitoes breeding and malaria transmission. Clean environment is an important component of malaria control strategy.

The measures to prevent and control mosquitoes breeding include environmental measures such as cutting down of overgrown weeds around dwelling houses, cutting down of water bearing plants, destruction and disposal of receptacles like empty cans, coconut shells, broken bottles, and tyres that retain water around the premises. (World Health Organization WHO, 2008).

One of the popular strategy of malaria control is the chemical measure which includes the use of insecticides to control vectors. Insecticides such as DDT Malathion and delta methane, are used in residual spraying of houses to destroy mosquitoes, also the use of kerosene or oil, sprayed on the surfaces of stagnant water to prevent mosquitoes breeding equally proved effective coupled with the use of mosquito repellent. Another control measure that is not commonly practiced is the biological method which is the use of introduction of predators that is, aquatic animal like Gumbusia fish and tilapia to feed on the mosquitoes larvae (Ikpeme, 2016).

According to Ikpeme (2016) the physical and mechanical measures of malaria control are the use of electronic swatter, killing of mosquitoes with broom, construction of concrete drainage system to allow free flow sewage of runoff water to avoid stagnation and use of protective clothes like shelves and trouser to protect mosquito bites. Chemo-prophylactic and chemotherapy, that is the used of anti-malaria drugs is also a control measures. Latest drug of choice are articulate coarsen. Ikpeme (2016) suggested that government should embark on aggressive prophylaxis rather than waiting to conduct curative approach which buttresses the fact that prevention is better than cure. These measures if properly harnessed could reduce malaria incidences to the barest level.

According to Basse, Ewona, Duke and Ikwen (2018) proper education gives awareness on prevention of negative health issues in the community. They observed that education is the process of giving awareness to an individual or a group of persons so as for them to know and have idea and knowledge about issues. Knowledge is power, without good education, the world will still be in the primitive or stone age. Education has brought in enlightenment, awareness, exposure, innovation and knowledge leading to scientific innovation through research. It is against this background that the study seeks to assess the environmental and human factors to effective control of malaria infection among residents of Calabar Municipality of Cross River State, Nigeria.

## **METHODOLOGY**

The research design used in this study was ex-post facto. Ex-post facto design was used because the issue under study already existed and data also is in existence. The issue of environmental and human activities to effective control of malaria infection is a recurring issue, this has made the researcher to investigate into this issue. The study design takes a general look at the variables through the use of questionnaire that was administered to respondents living in Calabar Municipality environment and carrying out various practices to control malaria infection.

The study employed survey or field method to arrive at its findings because the study deal with representative samples drawn from a large population of the people living in Calabar Municipality experiencing malaria infection. Purposive, and simple random sampling techniques was employed to get the units demographic variables and in selecting the respondents from each units in order to maintain fair representation. One hundred and twenty respondents were selected from each of the five selected communities of Akim, Diamond, Essien Town, Ikot Effanga and Ikot Eneobong. Purposive sampling technique was employed to select community of Akim, Essien Town, Ikot Ansa, Ikot Effa, Ikot Eneobong, IKot Omin, Diamond, Ikot Effanga, Akai Efa and Nyahasang. Simple random sampling procedures was then employed to select five communities; then simple random sampling procedures was also employed to select 120 residents from each of the five communities selected to make a sample size of six hundred.

The instrument was validated to ensure that items in the questionnaire represent the subject of interest and are accurate. The test-retest method of the reliability was used in ensuring reliability of the instrument. The researcher administered thirty (30) questionnaires to thirty residents and to those residents not used in the pilot study. The thirty instruments were administered at one week interval. Results obtained from the first and second test were analyzed using Pearson Product Moment Correlation Co-efficient to establish the relationship between the two results. The estimate for measurement for the research variables yielded high correlation coefficient which ranged from 0.72 to 0.92. The high correlation coefficient obtained shows that the research instrument is reliable, dependable and is absent of measurement error.

**RESULT**

The result of data analysis carried out on data collection on demographic information was done using frequencies and percentages while the hypotheses was tested using Pearson product moment correlation inferential statistical test tested at .05 level of significance.

**Table 1:** Frequency and percentages of study sample on demographic variables

Variable	Communities sampled	Frequency	Percentage (%)
Community	Akim	120	20
	Diamond	120	20
	Essien Town	120	20
	Ikot Effanga	120	20
	Ikot Eneobong	120	20
	Total	600	100
Gender	Male	200	33
	Female	400	67
	Total	600	100
Religion	Christianity	500	83
	Islam	100	17
	Traditional	0	0
	Others	0	0
	Total	600	100
Educational status	No schooling at all	0	0
	Primary school	100	17
	Secondary School	300	50
	Tertiary education	200	33
	Total	600	100

Source: Field work: 2020

Table 1 shows the description of sample in terms of demographic variables. It shows that five communities and 120 people from each community making up of 20% resulting to a sample size of 600 were used. 200 (33%) were male while 400 (67%) were female. 500 (83%) were Christians and 100 (17%) were Muslims. Finally, for educational status, 100 (17%) had primary school education, 300 (50%) had secondary school education while 200 (33%) had tertiary education qualifications.

**Hypothesis 1**

There is no significant relationship between the use of insecticide treated net and prevention of malaria infection.

Table 2: Pearson Product Moment Correlation analysis of the relationship between the use of insecticide treated net and prevention of malaria infection (N=600)

Variables	X	S	$\sum X^2(\sum X^2)$	$\sum xy$	r	Sig
Use of insecticide treated net	65.412	7.369	32527.318			
			34645.273	13753.303	.486*	.000
Prevention of malaria infection	60.727	6.738				
Prevention of malaria infection	60.727	6.738				

\* P<.05      df = 598

The results in Table 2 indicate that the calculated r value is .486. This means that there exists a positive and significant relationship between the use of insecticide treated net and the prevention of malaria infection. It suggests that the use of insecticide treated net helps in curtailing mosquitoes attack which lead to malaria infection prevention. The significant level of the calculated r value (P = .000) is less than the critical significant level, P= .05. This means that the observed positive relationship between the use of insecticide treated net and prevention of malaria infection is statistically significant at .05 significant level and 598 degree of freedom. Thus the null hypothesis is rejected. This means that the use of insecticide treated net lead to prevention of malaria infection.

**Hypothesis 2**

There is no significant relationship between cutting down of overgrown weed around the surrounding and prevention of malaria infection.

Table 3: Pearson Product Moment Correlation analysis of the relationship between cutting down of overgrown weeds around the surrounding and prevention of malaria infection. (N=600)

Variables	X	S	$\sum X^2(\sum X^2)$	$\sum xy$	R	Sig
Cutting down of overgrown weeds	93.600	13.908	115858.640			
			24645.273	23185.960	.460*	.000
Prevention of malaria infection	60.157	6.414				

\* P<.05      df = 598

The result of Table 3 shows that the calculated r-value is .460 which implies that there is a positive relationship between cutting down of overgrown weeds around the surrounding and prevention of malaria infection. This means that when bushes around the surrounding is cut down it gives mosquitoes no breeding place which in turn prevent malaria infection cause by mosquitoes' attack. The observed positive relationship between cutting down of overgrown weeds around the surrounding and malaria infection prevention is however, statistically significant at .05 significant level and 598 degree of freedom because the significance level of the critical calculated r value P=.000 is less that the significance level P<.05. Therefore, the null hypothesis is rejected. This means that cutting down of overgrown weeds around the surrounding lead to prevention of malaria infection.

### Hypothesis 3

There is no significant relationship between removal of stagnant water around the surrounding and prevention of malaria infection.

Table 4: Pearson Product Moment Correlation analysis of the relationship between removal of stagnant water around the surrounding and prevention of malaria infection (N=600)

Variables	X	S	$\sum X^2(\sum X^2)$	$\sum xy$	R	Sig
Removal of stagnant water	93.660	13.908				
			27193.173	21335.240	.380*	.000
Prevention of malaria infection	60.727	6.738				

\* P<.05      df = 598

As shown in Table 4, the calculated r value is .380, indicating that there exist a positive relationship between removal of stagnant water around the surrounding and prevention of malaria infection. The observed positive relationship implies that when stagnant water is being eradicated from the living surrounding, mosquitoes breeding place is destroyed thus leading to



prevention of malaria. The level of significance, P, of the calculated r value is .000. This means that the observed positive relationship between removal of stagnant water around the surrounding and prevention of malaria infection is statistically significance at .05 significance level and 598 degrees of freedom. Therefore, the null hypothesis is rejected. This means that removal of stagnant water around the surrounding lead to prevention of malaria infection.

## **DISCUSSIONS OF FINDINGS**

Findings of hypothesis one revealed that there is a significant relationship between the use of insecticide treated net and prevention of malaria infection. The findings of this hypothesis is in line with Olise (2007) who reported that the use of insecticide treated net has significantly lead to eradication of mosquitoes attack on human beings using the net as cover when sleeping. When mosquitoes perched on insecticide treated net, apart from it inability to get access into the net, the chemical use in treating the net kills the mosquitoes.

Analysis of hypothesis two revealed that there is a significant relationship between cutting down of overgrown weeds around the surrounding and prevention of malaria infection. The findings of this hypothesis is in line with National Roll Back Malaria Programme (2011) who asserts that mosquitoes breed favourably in bushes, when bushes grow around living resident, mosquitoes are prone to attack human beings living in such environment. Studies have indicated that surroundings devoid of bushes recorded insignificant presence of mosquitoes.

Findings of hypothesis three revealed that there is a significant relationship between removal of stagnant water around the surrounding and prevention of malaria infection. The findings of this hypothesis is in line with National Malaria Control Programme (2011) who asserts that water in stagnant ponds, tyres, bottles and other apparatus encouraged mosquitoes breeding. The remedy to eradication of mosquitoes in living premises is by removing stagnant water which mosquitoes breed. When this is done, malaria infection caused by mosquitoes is controlled and prevented.

## **Conclusions**

From the findings of this study, it was concluded that human attitude play an important role in the eradication of mosquitoes breeding which in turn prevent the spread of malaria. The practices of using insecticide treated net, cutting down of overgrown bushes and removal of stagnant water around the living surrounding have contributed to eradication of mosquitoes breeding places, thus leading to malaria infection prevention.

## **Recommendations**

Based on the findings of this study, the following recommendations were made.

1. Health and environmental education should be given to residents on the need to use insecticide treated net in order to prevent mosquitoes attack.
2. The living environment should be kept tidy and clean at all times by cutting down overgrown bushes in order to eradicate mosquitoes breeding site.

Stagnant water around the surrounding should be avoided. All empty tins, tyres, holes and other apparatus that store stagnant water for mosquitoes to breed in it should be emptied.

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