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Effectiveness Of Insecticide-Treated Mosquito Nets (Itns) In The Control Of Malaria Disease Among Slum Dwellers In Port Harcourt Metropolis, Rivers State.

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Abstract
The study investigated the effectiveness of insecticide-treated mosquito nets (ITNs) in the control of malaria among slum dwellers in Port Harcourt metropolis. Data were collected with the aid of structured questionnaire. Simple random sampling technique was used to select a sample size of 160 respondents from Mgbuoshimini and Bundu watersides. Analyses of data involved the use of descriptive statistics like frequency counts, percentage distribution and mean.The study revealed that the level of ITN awareness is high, many respondents possess ITNs but very few use them. It was also evident from the study that there are many factors affecting ITN usage. Some of the factors include, lack of accommodation, overcrowding, reduction of air flow, lack of proper ventilation, breathing difficulties, skin allergies, cultures or religions that forbid the use of ITNs, etc. The study, therefore, supports the need for Government to resettle slum dwellers in Mgbuoshimini and Bundu watersides to more decent and comfortable environments as slums are usually dirty, water-logged and favourable for mosquitoes' breeding, thereby, causing malaria. The study recommends that Government should ensure regular fumigation in Mgbuoshimini and Bundu watersides as well as other mosquito prone areas in the state, in order to kill the vectors (mosquitoes), thereby preventing malaria.
Key words: Effectiveness, Insecticide-treated Mosquito Net (ITN), Control, Malaria, Slum dwellers.

1. Introduction

Malaria is a mosquito-borne disease of humans and other animals caused by a type of micro organism of the genus Plasmodium (Collins and Barnwell, 2009). It begins with a bite from an infected female mosquito, which introduces the vector via its saliva into the circulatory system, and ultimately to the liver where they mature and reproduce. The disease causes symptoms that typically include fever and headache, which in severe cases can progress to coma or death. Malaria is widespread in tropical and subtropical regions in a broad band around the equator, including much of Sub-Saharan Africa, Asia, and the Americans. WHO (2010) has estimated that in 2010, there were 216 million documented cases of malaria. That year, between 655,000 and 1.2 million people died from the disease (roughly 2000–3000 per day), many of whom were children in Africa. Malaria is commonly associated with poverty and may also be a major hindrance to economic development (Nayyar, Breman, Newton and Herrington, 2012). There are a number of serious complications of malaria. Among these is the development of respiratory distress, which occurs in up to 25% of adults and 40% of children with severe P. falciparum malaria. Disease transmission can be reduced by preventing mosquito bites by the use of mosquito nets, ITNs and insect repellents, or with mosquito-control measures such as spraying insecticides and draining stagnant water.

Mosquito nets treated with insecticides – known as Insecticide-Treated Nets (ITNs) or bed nets – were developed in the 1980s for malaria prevention. ITN is estimated to be twice as effective as untreated nets, and offer greater than 70% protection compared with no net (Bachou, Tylleskär, Kaddu-Mulindwa and Tumwine 2006). These nets are dip-treated using a synthetic pyrethroid insecticide to double the protection by killing and repelling mosquitoes. It is recommended that the nets should be re-impregnated with insecticide every six months for maximum effectiveness.

United Nations agency (UN-HABITAT 2007), describes slum as a run-down area of a city characterized by substandard housing and squalor and lacking in tenure security. Slums are commonly seen as "breeding grounds" for social problems such as crime, drug addiction, alcoholism, high rates of mental illness and suicide. In many slums there exist high rates of disease – such as malaria – due to unsanitary conditions, malnutrition, and lack of basic health care.

The livelihoods of the poor are determined predominantly by the context in which they live and the constraints and opportunities this location presents. This is because context – economic, environmental, social and political – largely determines the assets available to people, how they can use them, and thus their ability to obtain secure livelihoods. Furthermore, the short and long-term livelihood aims of poor men and women are products of the context of which they are part, as they are in large part a response to the opportunities and constraints available.

To these slum dwellers, there are more constraints than opportunities. A UN Expert Group has created an operational definition of a slum as an area that combines to various extents the following characteristics: inadequate access to safe water; inadequate access to sanitation and other infrastructure; poor structural quality of housing; overcrowding; and insecure residential status (UN-HABITAT, 2007).

The presence of malaria in an area is as a result of a combination of many factors such as high human population density, high mosquito population density and high rates of transmission from humans to mosquitoes and from mosquitoes to humans. If any of these is lowered sufficiently, the parasite will eventually disappear from the area. However, it is not a gurantee that the condition may not be re-established if the condition favours parasites reproduction unless the parasite is eliminated from the whole world (Freedman 2008). Another predisposing factor to malaria infection is that in these areas where malaria disease is endemic, people usually retire to bed late due to hot weather condition. They prefer spending the early hours of the night outside their rooms, thereby exposing themselves to mosquito attack. It is in this light that Lengeler (2004) adviced that people should retire early to bed and instead sleep under insecticide treated mosquito nets or use Indoor Residual Spraying (IRS) to control the vector. Methods used to prevent malaria include medication, mosquito elimination and the prevention of mosquito from biting humans. The introduction of any of these measures in preventing malaria is most cost effective than treatment of the disease (Dupas & Cohen 2010).

Mosquito nets treated with insecticide create a protective barrier against malaria-carrying mosquitoes that bite at night. They help keep mosquitoes away from people and significantly reduce infection rates and transmission of malaria. Miller et al (2007), noted that the use of ITNs saved about 250,000 infants between the years 2000 and 2008 in Sub-Saharan Africa, yet only about 13 percent of household own ITNs. The benefits of the use notwithstanding, studies have shown that many people prefer sleeping without the nets. In sub-Saharan Africa, the reason for not sleeping under the nets vary from economic, cultural to religious beliefs among others. Dupas and Cohen (2010), observed that ITNs reduce air flow and sleeping under it is hotter than sleeping without one, which could be uncomfortable in the tropics without air-conditioner. According to them, others fear that the chemical in the ITN can even kill them if they sleep under the nets, while others hinged their non-usage on culture as it is considered a bad omen sleeping under net. On the other hand, Maxwell et al (2002), found that it was logistically problematic for rural dwellers to re-impregnate their nets every six months for effectiveness and therefore did not regard ITNs as convenient and effective long-term solution to the malaria problem.

The slums in Port Harcourt, Rivers State are known for high human population density, high mosquito population density and high rate of transmission of malaria disease between humans and mosquitoes, and therefore need ITNs to prevent deaths resulting from malaria infections. However, the prevalence of malaria disease and its high rate of morbidity in these areas require answers to questions such as: Are the slum dwellers aware of ITNs? Do they have them? If they do, do they use them? If no, what are the factors constraining the effective use of ITNs in the control of malaria disease? Answers to these pertinent questions necessitated this study.

2. Objectives of the Study

The specific objectives of this study were to:

1. describe the demographic characteristics of slum dwellers in Port Harcourt metropolis.
2. determine the level of ITN awareness among slum dwellers in Port Harcourt metropolis.
3. determine the sources of ITN acquisition among slum dwellers in Port Harcourt metropolis.
4. ascertain the level of ITN usage among slum dwellers in Port Harcourt metropolis.
5. examine the factors affecting ITN usage among slum dwellers in Port Harcourt metropolis.

3. Methodology

The study was carried out in Port Harcourt metropolis (Mgbuoshimini and Bundu watersides), Rivers State, Nigeria. These areas were purposively selected for been sub-urban areas of Port Harcourt city, characterised by over-crowding, unsanitary conditions, substandard housing, social disorganization, poverty, etc. Therefore, the rate of malaria infection is high hence mosquitoes breed in dirty and water-logged environments. Secondly, adequate sample size is assured based on the population size of the occupants.

Simple random sampling technique was used to select a sample size of 160 adult respondents, 100 from Bundu waterside and 60 from Mgbuoshimini waterside. A structured questionnaire divided into sections was used to collect data from the respondents, complemented with interview schedule. For objectives one and three respondents responded to the options provided as applicable to their conditions. Questions for objective two were yes/no options, and respondents reacted to them according to opinion. While data for objectives four and were elicited using the Likert 4-point rating scale pattern of agreement with values of 4, 3, 2 and 1 respectively. The data collected were analysed using frequency counts and percentage for objectives 1,2,and 3 respectively,

while frequency counts and mean statistics were used to analyse data generated for objectives 4 and 5 respectively, with minimum acceptable value of 2.5 and above.

4. Findings and Discussion

Table 1: **Demographic Characteristics of Slum Dwellers in Port Harcourt metropolis**

Age Range	Frequency (N = 160)	Percentage (100%)	Cumulative P.
10 – 20 yrs	80	50	50
20 – 30 yrs	50	31	81
30 – 40 yrs	25	16	97
Above 40 yrs	5	3	100
Sex			
Male	64	40	40
Female	96	60	100
Educational Qualification			
FSLC	80	50	50
WAEC/GCE	60	38	88
OND/NCE	15	9	97
HND/B.Sc	5	3	100
Primary Occupation			
Hawking	25	16	16
Trading	20	13	29
Fishing	15	9	38
Farming	10	6	44
Welding	5	3	47
Carpentry	10	6	53
Mason	15	9	62
White Collar Job	5	3	65
Hair Dressing	20	13	78
Tailoring	10	6	84
Barbing	5	3	87
Teaching	8	5	92
Drug Peddling	3	2	94
Driving	9	6	100
Others	-	-	-
Marital Status			
Single	20	13	13
Married	85	53	66
Divorced	15	9	75
Separated	15	9	84
Widowed	25	16	100
Number of Household Members			
1 – 3	10	6	6
4 – 6	45	28	34
7 – 9	60	38	72
10 & above	45	28	100
Type of Housing			
Make-shift structure	80	50	50
One-room apartment	50	31	81
Self-contain	30	19	100
One bedroom flat	-	-	-
Bungalow	-	-	-
Duplex	-	-	-

Source: Field Survey, 2013.

Table 1 reveals the demographic characteristics of the respondents. From the table, 80 respondents fell into the age range of 10 – 20 years; 50 respondents (20 – 30 years); 25 respondents (30 – 40 years); and 5 respondents

were above 40 years of age. Also, out of the 160 questionnaire items, that were distributed, completed and retrieved, 64 (40%) were filled by males and 96 (60%) were filled by females. Majority of the respondents were those who had FSLC 80 (50%) as their educational qualification, followed by those who had WAEC/GCE 60 (38%). Respondents who have educational qualifications of OND/NCE were 15 (9%) while those who have HND/B.Sc were very few 5 (3%). Furthermore, a good percentage of the respondents were hawkers (16%), followed by traders and hair dressers (13%) respectively, fishers and masons were (9%) respectively. Farmers, carpenters, tailors and drivers made up (6%) of the respondents respectively. Teachers were (5%). Welders, office workers and barbers occupied (3%) respectively. The least of the respondents were drug peddlers (2%). More so, 20 (13%) of the respondents were single, 85 (53%) were married. 15 (9%) were divorced and separated respectively, while 25 (16%) were widowed.

Table 1 further reveals that 10 households contained 1 – 3 members, 45 households contained 4 – 6 members, 60 households contained 7 – 9 members and 45 households contained 10 members and above. Above half of the respondents 80 (50%) lived in make-shift structures, 50 (31%) lived in one-room apartment, and 30 (19%) lived in self-contain. None of the respondents lived in bedroom flats, bungalows or duplexes. These are in line with what Mattingly, (1995) wrote, "The job opportunities available for the urban poor depend on their skills such as hawking, hair dressing, fishing, tailoring, etc. There are often high levels of unemployment and underemployment in slums. Many urban poor people survive through undertaking a variety of activities which mainly take place in the informal sector. Informal activities generally provide the poor with low cash incomes and insecure conditions. Few individuals who have better incomes as a result of informal activities include pimps and traders in drugs".

Table 2: **Level of ITN Awareness**

ITN Awareness	Frequency	Percentage (%)
Yes	140	87.5
No	20	12.5
Total	**160**	**100**

Source: Field Survey, 2013.

Table 2 reveals that the level of ITN awareness among slum dwellers in Mgbuoshimini and Bundu watersides is very high (87.5%). Only 12.5% of the respondents were not aware of ITNs. Despite the high level of ITN awareness, many people still suffer malarial attacks.

Table 3: **Number of Respondents in Possession of ITN**

ITN Possession	Frequency	Percentage (%)
Yes	135	84
No	25	16
Total	**160**	**100**

Source: Field Survey, 2013.

Table 3 shows that 84% of the respondents own ITNs while 16% did not. This is in contrast with what Miller, Korenromp, Nahlen, and Steketee (2007) wrote, "Although ITNs prevent malaria, only about 13% of households in Sub-Saharan countries own them".

Table 4: **Sources of ITN Acquisition**

Sources of ITN Acquisition	Frequency	Percentage (%)
Free distribution by Government	80	50
Markets	5	3
Private sectors	25	16
Churches	30	19
Others (NGOs, Clinics, etc.)	20	12
Total	**160**	**100**

Source: Field Survey, 2013.

Table 4 further shows the sources of ITN acquisition. 50% of the respondents received free ITNs from Government, 3% bought from markets, 16% received from private sectors, 19% received from churches and 12% received from other sources like Non-Governmental Organisations, Clinics, Maternities, Hospitals, Friends, etc. These sources of acquisition further confirm the high levels of ITN awareness and possession.

Table 5: **Level of ITN Usage**

VO	O	SU	NU	N	Total Resp.	Mean X	Decision
10	17	33	100	160	257	1.61	Reject

Source: Field Survey, 2013.

VO – Very often
O – Often
SU – Seldom use
NU – Never use

Table 5 reveals that the level of ITN usage is very low with a mean value of 1.61. 10 respondents used ITNs very often, 17 used ITNs often, 33 seldom used ITNs while 100 never used ITNs. The low level of usage was confirmed by Maxwell et al. (2002), "the fact that ITNs should be re-impregnated with insecticide every six months poses a significant logistical problem in rural areas, especially slums because they may not be able to re-impregnate them. As a result, these people may not regard ITNs as convenient, effective long-term solution to the malaria problem".

Table 6: **Factors affecting ITN Usage**

S/No	Factors	SA	A	D	SD	N	Total Resp.	Mean X	Decision
1.	Lack of accommodation	60	55	25	20	160	475	2.97	Accept
2.	There are many people in my room	40	60	35	25	160	435	2.72	Accept
3.	ITN reduces airflow	80	50	15	15	160	515	3.22	Accept
4.	It is hotter to sleep under the ITN	70	75	10	5	160	530	3.31	Accept
5.	Lack of proper ventilation	65	70	15	10	160	510	3.19	Accept
6.	Breathing difficulties	45	55	20	40	160	425	2.66	Accept
7.	My skin reacts to the chemical in the net	60	40	15	45	160	435	2.72	Accept
8.	ITN creates discomfort	90	30	14	26	160	504	3.15	Accept
9.	My skin is allergic to ITN	55	65	20	20	160	475	2.97	Accept
10.	My religion does not permit it	30	25	80	25	160	395	2.37	Reject
11.	My culture forbids sleeping under ITN	75	30	35	20	160	480	3.0	Accept
12.	I doubt if ITN works	46	55	25	34	160	433	2.71	Accept
13.	I lack the means to tie the net	70	45	27	18	160	487	3.04	Accept
14.	Stress of tying the net up everyday	60	30	40	30	160	440	2.75	Accept
15.	Air-drying or sun-drying difficulties	40	75	24	21	160	454	2.84	Accept
16.	Lack of means to retreat the net	85	50	10	15	160	525	3.28	Accept

Source: Field Survey, 2013.

SA – Strongly agree
A – Agree
D – Disagree
SD – Strongly disagree

Table 6 confirms that there are many factors affecting ITN usage among slum dwellers in Port Harcourt metropolis. 115 respondents agreed that they have accommodation problems while 45 respondents disagree. This has a mean value of 2.97. Therefore, majority of the respondents cannot use ITNs as it can only be tied in rooms. 100 respondents agreed that they are many sharing a room while 60 respondents disagreed. Here the question is, "who will use the ITN and who will not"? The mean value is high (2.72) and therefore confirms that this factor can affect ITN usage. With a mean value of 3.22, 130 respondents confirmed that ITN reduces airflow while only 30 disagreed. This can discourage one from using it. With the highest mean value of 3.31, 145 respondents

agreed that sleeping under an ITN is hotter than sleeping without one, while only 15 disagreed. These respondents cannot prefer a hotter condition at night. 135 respondents agreed that their rooms lacked proper ventilation while 25 had well ventilated rooms. The mean value is also high (3.19). According to majority of the respondents, ITN reduces airflow; therefore, it will be dangerous to sleep under one in a poorly ventilated room. This is in line with Dupas and Cohen (2010), "ITNs reduce air flow to an extent and sleeping under a net is hotter than sleeping without one, which can be uncomfortable in tropical areas without air-conditioning". 100 respondents agreed that they find it difficult to breathe well under ITNs and also, that their skins react to the chemical in the net, while 60 respectively, disagreed. These two factors have considerable mean values of 2.66 and 2.72 respectively. 120 respondents agreed that they feel uncomfortable sleeping under ITNs and that their skins are allergic to ITNs while 40 respondents, respectively disagreed. These factors have high mean values of 3.15 and 2.97 respectively.

Furthermore, about 101 respondents doubted the working of ITNs and 59 respondents did not. This has a mean value of 2.71. However, only 55 respondents agreed that their religions do not permit sleeping under ITNs while 105 respondents disagree, with a mean value of 2.37 which was rejected. On the other hand, 105 respondents agreed that their cultures forbid the use of ITNs while 55 respondents disagreed, with a mean value of 3.0. Many of the respondents (115) lacked the means to tie the nets in their rooms while only 45 had the means to tie the net. This has an accepted mean value of 3.04. With an accepted mean value of 2.75, 90 respondents see it as stress to always tie the net while 70 did not. Therefore, some of the respondents who have the means of tying the nets may not use the nets consistently due to the stress of tying them up. With a mean value of 2.84, 115 respondents have sun or air-drying difficulties, while 45 respondents did not. This factor affects ITN usage because ITNs should be sun or air-dried to maintain the effectiveness. The 135 respondents who own ITNs lacked the means to retreat the net. This is in line with Maxwell, et al. (2002), "the fact that ITNs should be re-impregnated with insecticide every six months poses a significant logistical problem in rural areas, especially slums because they may not be able to re-impregnate them. As a result, these people may not regard ITNs as convenient, effective long-term solution to the malaria problem".

5. Conclusion and Recommendations

From the results of the study, the following deductions were made:

1. That the environmental condition of the study area favours the prevalence of malaria disease, with stagnant water and poor drainage system, a breeding ground for mosquitoes .
2. That residents of Port Harcourt slums are aware of the need for Insecticide-treated Mosquito Nets (ITNs)
3. That many residents of slum areas own ITNs, given to them by the Governments (Federal, State and Local), Non-Governmental Organisations, individuals etc.
4. That despite the level of awareness and the benefits of using ITNs, majority of the respondents could not use them.
5. That the use of ITNs was constrained by many factors, ranging from economic,convinience, religious and cultural influences.

On the basis of the findings of the study, the following recommendations are made:

1. Rivers State Government should ensure regular fumigation of slums in Port Harcourt metropolis. This can go a long way in killing the vectors (mosquitoes) thereby preventing malaria.
2. Governments at all levels (Federal, State and Local) should subsidize malaria medications in favour of the poor and institute free medical care scheme for infants and the elderly persons. This will reduce the financial burden of malaria treatment.
3. Residents of slum areas should be resettled on a more decent environment, while the dotted shanties demolished given way for a well planned city.
4. Monthly environmental sanitation exercise should be introduced, monitored and enforced. Not only for the slum dwellers but state wide. This will assist in keeping environment clean, open up drainages where provided thereby preventing water logging and stagnation upon which mosquitoes breed.
5. Governments at all levels should step up campaign to enlighten people of the need to use ITNs and allay their fears and negative beliefs that discourage them from using it.
6. There should regular supply of ITNs to the people by Govrenments, her agencies and departments, while encouraging Non-Governmental Organisations to complement her efforts. This is necessary in reducing the challenges of re-inpregnating old nets, the process respondentst complained was a discouraging factor.

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