Utilization of Mosquito Nets and Malaria Related Under-Five Mortality in Abia State, Nigeria

Imo, Chukwuechefulam Kingsley, PhD
Department of Sociology, Adekunle Ajasin University,
Akungba-Akoko, Ondo State, Nigeria
Prof. Isiugo-Abanihe, Uche Charlie
Department of Sociology, University of Ibadan, Ibadan,,Oyo State, Nigeria

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Abstract

In spite of huge global investments in the production and distribution of mosquito nets to protect people from malaria; it has continued to militate against the reduction of mortality in Nigeria. The study, therefore, examined the nexus between utilization of mosquito nets and malaria related under-five health outcome. Two local government areas were randomly selected from each of the three senatorial districts, and stratified along urban and rural communities. Purposive sampling technique was used to select 609 mothers within childbearing age and who had under-five children across the communities. Descriptive statistics, Chi-square tests and logistic regression at $p<0.05$, and thematic content analysis were used for data analyses. The respondents' age was 32.6±5.8 years, 84.6% were married/living together, 55.0% had secondary education, while 42.7% were in paid/civil service jobs. Under-five mortality was 19.3% higher amongst rural than urban dwellers. Ownership of mosquito nets (treated or untreated) varied by place of residence with 60.1% and 39.9% for urban and rural areas respectively. About 62% of the dead under-five children never slept under mosquito nets. The likelihood of under-five mortality significantly increased by non-ownership of mosquito nets (Odds-Ratio (OR): 2.476) and reduced by number of mosquito nets (OR: 0.278). Wrong methods adopted by mothers in using mosquito nets, was deduced as a contributory factor causing under-five mortality for home with fewer nets. Information on the proper use of the mosquito nets would help achieve the goal of universal access for the at-risk populations of children under age five and pregnant women.

Keywords: Mosquito nets, malaria, under-five mortality, Abia State in Nigeria

1 Background of the Study

It has been estimated that 216 million episodes of malaria occurred globally in 2010 with resultant 655,000 deaths. About 91% of malaria burden in that year occurred in Africa while 86% of the global malaria death was in children under five years of age (WHO, 2011). It was also documented that about 300,000 children die of malaria and over 30 million pregnancies threatened throughout Africa each year (NPC, 2012). In Nigeria, malaria remains the country's most important health problem and accounts for 25% of infant mortality, 30% of under-5 mortality and 11% of maternal mortality (NPC, 2010). Between 2000 and 2010, at least 50% of the population had one episode of malaria per year, while children below 5 years had two to four attacks (FMoH, 2011). The use of mosquito nets by vulnerable groups in highly endemic communities is one of the major indicators in the 2014-2020 national malaria strategic plans (FMoH, 2013).

Malaria remains an important cause of morbidity and mortality in Nigeria. Nigeria accounted for 32 percent of the global estimate of 655,000 malaria deaths in 2010 (WHO, 2012). Malaria currently accounts for nearly 110 million clinically-diagnosed cases per year, 60% of outpatient visits, and 30% of hospitalizations in Nigeria alone (NPC & ICP Macro, 2009; NPC, 2012). Use of mosquito nets by pregnant women is an important strategy to prevent malaria morbidity and to reduce the negative effects of malaria on pregnancy and pregnancy outcomes. The use of existing Insecticide Treated Nets (ITNs) varied among the states in the South Eastern Nigeria. About 37% households in Abia State compared to 50.9% and 40.4% in the neighbouring Ebonyi and Enugu States, respectively slept under any type of mosquito net the night before the 2013 survey (NPC and ICF, 2014). In spite of the high level of distribution of mosquito nets to pregnant women in Abia State, adequate social research attention has not been given to their utilization as determinants of malaria related under-five mortality to ascertain the level of disparity that exists between urban and rural areas. It is against this background that this study attempts to examine utilization of mosquito nets and malaria related under-five mortality in Abia State.

Pregnant women and children are most at risk of malaria transmission and its effects. In children less than 5 years old, a delay in accessing treatment for uncomplicated malaria beyond 48 hours from the onset of symptoms increases fatality (Sarkar, Murhekar, Shah, van Hutin & von Seidlein, 2012). Overall, 18 percent of pregnant women slept under some type of mosquito net the night before the 2013 survey (NPC and ICF, 2014). Studies have shown that malaria in pregnancy causes maternal anaemia, miscarriage, and low birth weight. In endemic countries, it is the leading cause of maternal mortality and one of the primary causes of neonatal deaths (Breman, Egan & GT, 2001; Prothero, 2001) In Nigeria, malaria is the

leading cause of under-five mortality contributing 33% of childhood deaths and 25% infant mortality. As a child will typically be sick of malaria between 3-4 times in one year, the disease is a major cause of absenteeism in school aged children, thus impeding their educational and social development (Oresanya, Hoshen & Sofola, 2008).

The mortality from severe malaria in young children usually exceeds 10%, and preschool children represent a particularly vulnerable group due to their limited immunity against infection (Dondrop, Lee & Faiz, 2008). The management of severe malaria remains challenging, mainly due to the fact that it does not only depend on the use of effective antimalaria drugs but also the use of effective parenteral antimalaria drugs, but it also depends on relatively cost-intensive supportive measures, the availability of highly skilled personnel, use of treated mosquito nets (Day & Dondrop, 2007), functional referral systems, blood transfusion services, good infrastructure, and adequate organization of hospital services (Gilles, 2000). Insecticide treated nets reduce human contact with mosquitoes and are effective malaria prevention intervention. ITNs have been shown to reduce severe disease due to malaria in endemic regions and reduce all-cause mortality by approximately 20% (Pettifor, Tailor & Nku, 2008). Despite the knowledge that ITNs are effective in the prevention of malaria, ITN coverage and utilisation still remain low in many African countries, where Nigeria is part (Minja, Schellenberg & Mukasa, 2008). It is evident that even when insecticidal bed nets are distributed free of cost instead of cost recovery or (heavily) subsidized cost approach, evidence from 40 malaria-endemic African countries shows that the coverage becomes more equitable (Noor, Mutheu, Tatem, Hay & Snow, 2009), and also, rapidly scalable (Noor, Fegan, Akhwale, Cousens & Snow,2007).

The burden of malaria, its prevention and control remains a challenge despite the existence of effective technologies (WHO, 2003). A recent study (Fegan, Noor, Akhwale, Cousens & Snow, 2007) reported 44% reduction in mortality due to the use of insecticide-treated bed nets (ITNs). The net is said to have been properly deployed when it is tucked under the sleeping mat (or mattress) or made to touch the ground all round. A study has found that the proper deployment of all the nets in a household could reduce the indoor resting densities of fed anopheline mosquitoes in the house by as much as 77.8%, in a single night; whereas the non-coverage of even a single person in the household is capable of reducing the effectiveness of the nets to 23.8% (Gimnig, et. al., 2003).

In realization of the effectiveness of ITN against malaria, there have been improvements in the production of ITNs. Between 2008 and 2010, a cumulative total of 289 million ITNs were delivered to sub- Saharan Africa, enough to cover 76% of the 765 million persons at risk (WHO, 2010).

However, the use of ITN in Nigeria falls short of global targets (UN, 2008). The 2008 Nigeria Demographic and Health Survey (NDHS) results indicate that 17% of households in Nigeria own a mosquito-net (treated or untreated), and 8% of households own more than one mosquito-net. Sixteen percent of households own at least one ever-treated mosquito net, and 7% own more than one ever-treated mosquito- net. The average number of ITNs per household was less than one, which could be attributed to a weak supply and distribution mechanism (NPC and ICP Macro, 2009).

In spite of the current efforts at providing free ITN to vulnerable groups, as part of the attainment of the millennium development goal, and the recognition by the Nigerian government that access to ITN and other malaria preventive and curative services which is a right to all vulnerable Nigerians (FMH, 2008). However, it has been revealed that net ownership does not always translate to use (Ordinioha, 2007) with factors such as low mosquito activity and high night time temperature capable of reducing use to as low as 20%. Low mosquito activity has particularly been noted to be a very important deterrent to ITN use in several communities in Nigeria, where the net is predominantly used for mosquito nuisance control, even as malaria transmission is stable and perennial in the communities (Ordinioha, 2007). Therefore pregnant women should be encouraged to use ITNs to protect their unborn baby. A Study in Ethiopia reveals that household ITN ownership and use remain below the current Roll Back Malaria targets of Universal coverage (Deressa, Fentie, Girma & Reithinger, 2011).

The use of ITNs is very effective in the control of malaria in pregnancy (Ter Kuile, Terlouw, Phillips-Howard, Hawley, Friedman & Kariuki, 2003), and it is estimated to be twice as effective as the untreated nets (Yusuf, Dada-Adegbola, Ajayi & Falade, 2008). Nevertheless, the use of ITNs is still limited mainly because of its unavailability and cost, and partly because of the discomfort associated with the nets and the women's fear of possible effects of the impregnated chemicals on them and their unborn babies (Mbonye, Neema & Magnussen, 2006). Prevention of malaria during pregnancy via the use of ITNs is no doubt one of the major interventions aimed at reducing maternal and infant morbidity and mortality rates, and thus achieving the fourth, fifth and sixth Millennium Development Goals (MGDs). This study therefore aimed at determining the utilization of this evidence-based malaria preventive strategy (treated and untreated mosquito nets) and the under-five malaria related health consequences associated with it as a result of use/non use among childbearing women in study area.

In conclusion, utilization of mosquito nets (treated and non-treated) play a vital role in child’s health outcomes in Nigeria. As a result the gap in social research on utilization of mosquito nets as determinants of malaria related under-five mortality in Abia State, therefore, becomes the

justification of this study.

2. Materials and Methods

The study utilized explanatory study design involving survey research with a multi-stage sampling technique in selecting a sample size of 609 women drawn the three Senatorial Districts of Abia State (Abia North, Abia Central and Abia South). The procedures adopted in the selection of the respondents were as stated below:

Stage 1: The first stage involved the simple random selection of two Local Government Areas (LGAs) each from the three Senatorial Districts. The LGAs selected were Bende/Umunneochi, Umuahia North/South and Aba North/South.

Stage 2: This stage involved purposive selection of Umuahia North, Aba North and Aba South LGAs each form the three Senatorial Districts to represent urban areas, while Umuahia South, Bende and Umunneochi LGAs were selected to represent rural areas based on their ecological factors.

Stage 3: The third stage adopted the simple random sampling of six roads/streets each from the urban centres and three communities each from the rural areas, using the lists provided from each of the LGAs.

Stage 4: In the fourth stage, a systematic selection of ten buildings each from the eighteen selected roads/streets following the allotted building numbers by the state government, and a random selection of twenty buildings from the nine rural communities were employed.

Stage 5: The final stage of the procedure was the purposive selection, from a selected building, of a woman who had given birth to at least one child in the last five years that preceded the study. In each selected building, if more than one woman had given birth to at least a child, a simple random technique was employed to select one person for the study. The questionnaire was administered by face-to-face interview; this increased the response rate and ensured that all the questionnaires were returned.

In addition to the quantitative survey data, qualitative data were collected involving In-depth Interviews (IDIs) and Focus Group Discussions (FGDs). Participants were purposively selected through contact, and convenient dates to conduct the interview were agreed. The language of the interview was either English language or Igbo language depending on the literacy level of the interviewee or the focus group.

The sample size for the survey research was calculated using Cochran's statistical formula for calculating minimum sample proportion. The minimum sample size needed to estimate the prevalence of under-five mortality to within 5% of the estimate of 157 per 1,000 (NPC and ICP Macro, 2009). At a 5% level of significance using the formula below:

$$N = \frac{(Z\alpha)^2 \times pq}{d^2}$$

where
N = Minimum sample
Zα = Standard score: 1.96 (Assuming a level of error of 5%)
p = Prevalence of outcome measure: 0.157 (under-five mortality)
q = 1-p = 1-0.157 = 0.843
d = Absolute deviation: 5% = 0.05 (this mean that the estimate for under-five mortality is within 5% from the assumed true rate). Assuming a prevalence rate of 50%

$$N = \frac{203 \times 100}{50} \quad N = 406.$$

The sample size for the study was increased by 50% (N= 609) to allow for statistical analysis of different variables and direct estimation of mortality in the study area. The study population comprised women within the child bearing age range of 15-49, that had given birth to at least one child in the last five years irrespective of socioeconomic background.

A methodological triangulation of both quantitative and qualitative techniques was adopted in gathering the data. This comprised the utilization of documentary sources, structured interviews (questionnaires), 20 IDIs and 6 FGDs sessions with minimum of 7 and maximum of 10 participants each. The participants categorized as young (15 – 24 years), mid (25 – 39 years) and old (40 – 49 years) were women who had experienced child birth in the last five years, from different socio-economic backgrounds (educational levels, place of residence, and occupational status) with emphasis on their age categories were selected and interviewed from each of the selected urban and rural areas of the State. The reason was to understand holistically the factors under investigation and to provide more insight into the determinants of under-five mortality in the area.

There Statistical Package for Social Sciences (SPSS) version 21.0 was used for quantitative data analysis at univariate, bivarite and multivate levels. Logistic regression model was used to predict the influence of infant nutrition on under-five health outcome. As regards the qualitative data, thematic manual content analysis was used for data collected from the in-depth interviews and FGDs.

Ethical approval was obtained from the Review Committee of the Federal Medical Centre (FMC), Umuahia which reviewed the proposal, questionnaire, and consent form before providing the clearance. All study subjects participated voluntarily and gave informed consent; no participant suffered physical or emotional harm as a result of the study; the study did not disclose participants' names or addresses.

3. Results and Discussion of Findings

Socio-Demographic Characteristics of the Respondents by Residence

Data were collected from 609 respondents comprising women of childbearing age who must have given birth to at least one child in the five years preceding the study in urban and rural residential locations. The mean age of the respondents was 32.6±5.8 years. There was no much difference between the mean ages of the respondents from rural and urban areas, with 32.4±6.3 and 32.6±5.3 years respectively. This indicates that most women in the sample were in the prime child bearing age.

As regards the marital status of the respondents, the majority of the respondents (84.6%) were married and living together with their spouses. Data on educational attainment of the respondents revealed that the largest proportion (55.0%) had secondary education followed by 29.9% with tertiary education. Nearly the same scenario was observed for their husbands. There was a disparity in educational attainment by place of residence, with 61.3% of rural respondents having received secondary education relative to about 49% of urban respondents, while 39% of urban women had tertiary education; only 21% of rural women had tertiary education.

Data on occupation of the respondents revealed that the largest proportion (42.7%) of them were in paid/civil service jobs with disparity between urban and rural areas as the majority (51.3%) of urban residents were in paid/civil service jobs compared to 34.1% of rural respondents. while 25.9% of rural respondents were unemployed compared to 10.2% urban respondents. Only 5.4% of the respondents who engaged in farming indicated that the zeal for farming has declined in the area, which is not unconnected with the high level of educational attainment in Abia State.

In all, the mean monthly income was N24,027. The disparity in the mean monthly income of the respondents in the areas is expected as a result of the gap in educational attainment and occupation of urban and rural respondents.

Table 2: Distribution of Respondents' Selected Socio-Demographic Characteristics by Place of Residence

	Residence		All Women
Characteristics	**Rural**	**Urban**	**N (N=609)**
Age Mean →	**(32.4)**	**(32.6)**	**(32.6)**
15 - 29	100(32.8%)	77(25.3%)	177(29.1%)
30 - 39	157(51.4%)	192(63.2%)	349(57.3%)
40 +	48(15.7%)	35(11.5%)	83(13.6%)
Total	**305(100%)**	**304(100%)**	**609(100%)**
Marital Status			
Single	8(2.6%)	19(6.3%)	27(4.4%)
Married/Living together	269(88.2%)	246(80.9%)	515(84.6%)
Widowed/Separated/Divorced	28(9.2%)	39(12.8%)	68(11.0%)
Total	**305(100%)**	**304(100%)**	**609(100%)**

Education			
Primary and Less	30(9.8%)	13(4.3%)	43(7.0%)
Secondary	187(61.3%)	148(48.7%)	335(55.0%)
Tertiary	64(21.0%)	118(38.8%)	182(29.9%)
Others	24(7.8%)	25(8.2%)	49(8.0%)
Total	**305(100%)**	**304(100%)**	**609(100%)**
Husband Education			
Primary and Less	52(17.7%)	20(7.0%)	72(12.4%)
Secondary	157(53.2%)	142(49.8%)	299(51.6%)
Tertiary	62(21.0%)	98(34.4%)	160(27.6%)
Others	24(8.1%)	25(8.8%)	49(8.4%)
Total	**295(100%)**	**285(100%)**	**580(100%)**
Occupation			
Unemployed	79(25.9%)	31(10.2%)	110(18.1%)
Paid/Civil Servant	104(34.1%)	156(51.3%)	260(42.7%)
Farming	29(9.5%)	4(1.3%)	33(5.4%)
Others	93(30.5%)	113(37.1%)	206(33.9%)
Total	**305(100%)**	**304(100%)**	**609(100%)**
Monthly Income (N) Mean →	**(N14,883)**	**(N32,802)**	**(N24,027)**
Less than 15,000	144(75.8%)	92(46.5%)	236(60.9%)
15,001 - 35,000	32(16.9%)	62(31.3%)	94(24.2%)
35,001 +	14(7.4%)	44(22.2%)	58(15.0%)
Total	**190(100%)**	**198(100%)**	**388(100%)**

Respondents' previous under-five mortality experience

Table 3 shows previous experience of under-five mortality of the respondents. The result showed that the mean number of children born alive was 3.1±1.5 children. There was little difference in the mean number of children between urban and rural respondents (3.0 and 3.2 respectively). About one-half of the respondents (50%) had experienced under-five mortality in the study area with substantial difference between rural (59.3%) than urban (40.0%) areas.

The majority (56.1%) of under-five mortality recorded were male children. A little above half of the respondents (51.5%) experienced infant mortality, with little differences between urban and rural areas. Data on the dead child's position is an indication that the complications and strange experiences related to first-two pregnancies could be contributory factor to childhood mortality. This is line with some respondents' opinions that first pregnancy experience was excruciatingly painful and uncomfortable. Some of the respondents put their opinions their way:

> *I resorted to personal remedies to strange development in my husband's absence during my first pregnancy. At a time, l was fed up with the pregnancy until l finally gave birth to the child, though he passed away after some months* (Urban FGD, respondent aged 27, Umuahia North LGA).

Another respondent posited that;

> *... it is not easy to be a woman. This was my comment the first time l was pregnant of my dead child. In fact, both my*

husband and I became confused at a point. I thank God for saving my life because it was totally as if l was in another realm during that period (Rural IDI, respondent aged 26, Umunnaochi LGA).

On the experience of babies' ailments, The Table shows that majority (60.5%) of the under-five mortality involved a particular disease before the eventual death of the child. Similar situation was observed for urban and rural locations in this regard. Among the children who had some ailments, the majority (54.9%) had fever, followed by 28.6% that had diarrhoea and 26.4% that had measles. A large proportion of urban (64.7%) and rural (49.1%) under-five deaths were associated with fever before their deaths.

Table 3: Distribution of Respondents by Previous Childhood Mortality Experience

	Place of Residence		**R & U**
Characteristics	**Rural**	**Urban**	**N (N=609)**
Previous experience (U-5 death)			
Yes	181 (59.3%)	120(40.0%)	301(49.8%)
No	124(40.7%)	180(60.0%)	304(50.2%)
Total	305(100%)	300(100%)	605(100%)
Sex of the dead child			
Male	101(55.8%)	68(56.7%)	169(56.1%)
Female	80(44.2%)	52(43.3%)	132(43.9%)
Total	181(100%)	120(100%)	301(100%)
Age at which child died			
Mean →	**2.0**	**2.2**	**2.1**
Less than 1 year	95(52.5%)	60(50.0%)	155(51.5%)
1 – 5 years	86(47.5%)	60(50.0%)	146(48.5%)
Total	181(100%)	120(100%)	301(100%)
The dead child's position			
Mean →	**2.2**	**1.9**	**2.1**
1 – 2	125(69.1%)	100(83.3%)	225(74.8%)
3 – 4	46(25.4%)	16(13.3%)	62(20.6%)
5 +	10(5.5%)	4(3.3%)	14(4.7%)
Total	181(100)	120(100)	301(100%)
Experience of Child Disease			
Yes	144(63.0)	68(56.7)	182(60.5)
No	67(37.0)	52(43.3)	119(39.5)
Total	181(100)	120(100)	301(100)
Name of Disease			
Measles	24(21.1)	24(35.3)	48(26.4)
Tetanus	18(15.8)	4(5.9)	22(12.1)
Fever	56(49.1)	44(64.7)	100(54.9)
Diarrhoea	36(31.6)	1623.5)	52(28.6)
Pertussis (Whooping cough)	12(10.5)	4(5.9)	16(8.8)
Others	18(15.8)	4(5.9)	22(12.1)

Distribution of Respondents with experience of Child Disease by Baby sleeping under Mosquito Nets

Regarding the experience of child disease and baby sleeping under mosquito nets, the chi-square test revealed a significant association with p<0.000. The results show that about 60% of the babies who slept under mosquito nets did not have experience of child disease. Over two-thirds of the babies whose mothers reported to have not slept under mosquito nets had experience of child disease. This is line with some respondents' opinions that first pregnancy experience was excruciatingly painful and uncomfortable. Some of the respondents put their views this way:-

> *Actually, my baby has been having one ailment or the other. Most especially fever (malaria). Though, he does not sleep under mosquito nets. Do you think his experience is as a result of not sleeping under mosquito nets? (Rural IDI, respondent aged 30, Bende LGA).*

Another respondent reported that:-

> *We must face the reality. When a child sleeps under mosquito nets, the probability of the child experiencing any form of disease will be reduced. Permit me to use my babies as example. Hardly my husband and I run up and down in search remedies to babies' ailment, when we have them from the beginning* (Urban FGD, respondent aged 42, Umuahia North LGA).

In the same vein, a rural respondent posited that:-

> *A child that sleeps under mosquito net will not be exposed to some diseases. But government has a lot to do in terms of re-strategizing on the distribution and explanation to mothers on how to use mosquito nets* (Rural FGD, respondent aged 33, Umuahia South LGA).

Table 4: Distribution of the Children sleeping under Mosquito Nets by Experience of Child Disease

	Child Sleeping under Mosquito Nets		
Experience of Child Disease	Yes	No	**P-Value ($X^{2)}$**
Yes	40.4	72.7	0.000
No	59.6	27.3	31.1
Total	100	100	

Use of Mosquito Nets with incidence of Under-Five Mortality by Selected Characteristics

All respondents were asked whether they own a mosquito net and, if so, how many. Table 4 shows that one-half of the respondents reported not having a mosquito net (treated or untreated). There was a great disparity on the ownership of mosquito nets (treated or untreated) by place of residence

as the majority (60.1%) of urban households did not have a mosquito net relative to about 40% of their rural counterparts. Data on number of mosquito nets owned by households revealed that the mean number of mosquito net owned by the respondents was 2.1 nets. The mean for urban and rural areas were 2.2 and 1.9 nets respectively. The majority of the households (60.4%) that admitted owning mosquito nets reported having 1-2 nets. A greater proportion of rural households than their rural counterparts (68.4% and 55.1% respectively) owned 1-2 mosquito nets. It was revealed that respondents in urban area were more likely to owe more mosquito nets than their rural counterparts.

The use of insecticide-treated nets (ITNs) or long-lasting insecticidal nets (LLINs) is the main method of malaria prevention employed in Nigeria. Table 5 below shows that the majority (62.1%) of the dead under-five children never slept under mosquito nets, with similar scenario observed for both urban and rural locations. Additionally, nearly three-quarters (74.1%) of the respondents whose children died before age 5, did not use mosquito net during the pregnancies of the dead children, with little variation between urban and rural dwellers.

Table 5: Distribution of the Respondents with incidence of Under-Five Mortality by Selected Characteristics

	Place of Residence		**R & U**
Characteristics	**Rural**	**Urban**	**N (301)**
Ownership of Mosquito net(s) by your family			
Yes	120(39.9%)	178(60.1%)	298(49.9%)
No	181(60.1%)	118(39.9%)	299(50.1%)
Total	301(100%)	296(100%)	597(100%)
No of Mosquito net(s)			
Mean →	**1.9**	**2.2**	**2.1**
1 – 2 nets	82(68.45)	98(55.1%)	180(60.4%)
3 +	38(31.6%)	80(44.9%)	118(39.6%)
Total	120(100%)	178(100%)	298(1005)
Dead child slept under M/net			
Yes	66(36.5%)	48(40.0%)	114(37.9%)
No	115(63.5%)	72(60.0%)	187(62.1%)
Total	181(100%)	120(120%)	301(100%)
Mother slept under M/net			
Yes	42(23.2%)	36(30.0%)	78(25.9%)
No	139(76.8%)	84(70.0%)	223(74.1%)
Total	181(100%)	120(100%)	301(100%)

Distribution of Respondents with experience of Under-five Mortality by households' Ownership of Mosquito Nets

The use of insecticide-treated nets is currently considered the most cost-effective method of malaria prevention in highly endemic areas. All the

respondents in the study were asked whether they own a mosquito net (treated or untreated) and if so the number of mosquito nets to a household. Table 6 shows that the majority respondents (54.8%) who had experience with under-five mortality did not own mosquito nets. On the other hand, the result was different for households that did not have under-five mortality. The results differ substantially between urban and rural areas as the majority of rural households (62.4%) with incidence of under-five morality reported not having any mosquito net. About 57% of urban households that had incidence of under-five mortality admitted ownership of mosquito net, relative to 61.6% of those who have not experienced under-five mortality. This implies that ownership of mosquito nets is more of an urban than rural phenomena. However, the result revealed that mosquito nets ownership does not always translate to use. Corroborating the above finding, some respondents put their views this way:-

> *... in most cases, even when you have the nets, according to some of us, hanging them becomes difficult. Although, I think the mosquito nets are not needed where there are no mosquitoes* (Rural IDI, respondent aged 31, Umunnaochi LGA).

Another respondent posited that;

> *There are problems associated with the use of mosquito nets which include inconvenience, problems with hanging mosquito nets, lack of space and low awareness of need as reasons for not using nets* (Rural FGD, respondent aged 44, Bende LGA).

Data on number of mosquito owned by households revealed that the fewer the number of mosquito to a household, the higher the incidence of under-five mortality. Over two-thirds of the respondents whose households owned 1-2 mosquito nets had higher experience of under-five deaths compared with about 26% of those that reported 3 or more mosquito nets. The same pattern of high under-five mortality for homes with fewer nets was observed in both rural and urban areas. The above result could be a function of the methods adopted by mothers in using such mosquito nets; some homes use mosquito nets more effectively than others. The methods reported by some respondents are given below;

> *The mosquitoes in this area are blood sucking demons that no one would like to have anything to do with them. Since we have known their plans, we had to device another way out by using the mosquito nets we have to protect the windows to prevent them from gaining entry* (Urban FGD, respondent aged 27, Aba South LGA).

Another respondent posited that;

...as you people can see, we had to contact a carpenter to construct net doors with the mosquito nets that were given to me for my household because of the colony of mosquitoes in this our neighbourhood. Though the mosquitoes still find their ways into our rooms at times, but not like the way it was when we had not initiated the idea of having net doors (Urban IDI, respondent aged 34, Aba North LGA).

Table 6: Distribution of Respondents with incidence of Under-Five Mortality by ownership of Mosquito Nets

Variables/Categories	All Women (%)		Rural (%)		Urban (%)	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**
Ownership of mosquito net						
Yes	45.2	54.1	37.6	43.3	56.7	61.6
No	54.8	45.9	62.4	56.7	43.3	38.4
Total	**100**	**100**	**100**	**100**	**100**	**100**
Number of mosquito net						
1 - 2						
3+	74.3	50.0	72.1	63.5	76.5	43.4
Total	25.7	50.0	27.9	36.5	23.5	56.6
	100	**100**	**100**	**100**	**100**	**100**

Multivariate Analysis of selected Socio-Demographic and mosquito net factors influencing incidence of Under-Five Mortality

Logistic regression is appropriate in this scenario since the dependent variable is dichotomous (binary) as a respondent either had a child that died before age 5 or not. Having dead under-five is coded 1, else equal to 0. Table 7 below displayed the results of the logistic regression analysis of the influence of socio-demographic factors on the incidence of under-five mortality. The finding shows the influence of mother's age on the experience of under-five mortality. The respondents aged less than 40 years were more likely to experience under-five mortality than their counterparts in the age group 40 and above.

Level of education also influenced the incidence of under-five mortality in the study areas. Those with secondary, tertiary and 'other' category education were less likely to have experienced of under-five mortality than those with primary education (the reference category). Result on occupation of the respondents showed no relationship between their type of jobs and under-five mortality. The single/widowed/ divorced respondents were 0.642 times less likely to experience infant mortality than those who are married/living together (the reference category).

The table shows that ownership of mosquito nets and number of mosquito nets owned by households was statistically significant. Households

without mosquito nets were 2.476 times more likely to have experienced under-five mortality than their counterparts that had mosquito nets (the reference category). In addition, incidence of under-five mortality declined with higher number of mosquito nets. Those with 3 mosquito nets and above were 0.278 times less likely to have experienced under-five mortality. The relationship between the respondents' place of residence and incidence of under-five mortality conformed to expectations. Those that resided in urban areas were 0.490 times less likely to have under-five mortality than their rural counterparts (the reference category).

Table 7: Logistic Regression showing the likelihood of incidence of under-five Mortality by selected Socio-Demographic Characteristics

Variables	Odd-Ratio Exp (B)	P-values
Age		
40 and above (RC)	1.000	-
< 24	1.063	0.893
25-29	1.652	0.107
30-34	1.687	0.074
35-39	1.801	0.068
Education		
Primary (RC)	1.000	-
Secondary	0.139	0.000*
Tertiary	0.083	0.000*
Others (to include no education)	0.182	0.007*
Occupation		
Unemployed (RC)	-	-
Paid/civil servant	2.350	0.002*
Farming/Petty Trading	2.083	0.004*
Labourer/Artisan/others	0.369	0.017*
Ownership of Mosquito nets		
Yes (RC)	1.000	-
No	2.476	0.018*
No of Mosquito net(s)		
1 – 2 nets (RC)	1.000	-
3 +	0.278	0.001*
Residence		
Rural (RC)	1.000	-
Urban	0.490	0.000*
RC – Reference Category	*** Significant at < 0.05**	

3.1 Discussion of Findings

The study reveals that most women in the sample were in the prime child bearing age. Incidence of mortality was high in the area with substantial difference between rural than urban areas and among male children. The result validated the findings of NPC and ICP (2009) that revealed a higher under-five mortality in rural than urban areas and United

Nations, (2006) observation that there is a difference in male and female mortality in infancy. Data on age at the death of the dead child showed that infant deaths were high in the area. The high percentage of under-five deaths among children within position 1-2 revealed that the complications and strange experiences related to first-two pregnancies were contributory factor to childhood mortality.

The effects of ownership of mosquito nets, number of mosquito nets owned by households and number of persons living in households on incidence of under-five mortality conformed to expectations. Also, it was revealed that the methods adopted by mothers in using such mosquito nets; some homes use mosquito nets more effectively than others. However, the above finding corroborates several studies which revealed that net ownership does not always translate to use (Ordinioha, 2007; Binka & Agongo, 1997) with factors such as low mosquito activity and high night time temperature capable of reducing use to as low as 20%.

The common reasons attributed to non use of mosquito nets by some children to sleep under mosquito nets include difficulty in hanging, inconvenience, lack of space and low awareness of need for mosquito nets. As such, non use of mosquito nets by under-five children in the study area could probably be contributing to the prevalence of fever and child health challenges. However, the possibility of having the experience of under-five mortality may decline if actions are expedited toward free distribution of long-lasting insecticidal nets (LLINs) through campaigns, public health facilities, faith-based organisations (FBOs), and non-governmental organisations (NGOs) with the goal of achieving universal access for the at-risk populations of children under age five and pregnant women.

4. Conclusion and Recommendation

It is, therefore, concluded that wrong and non use of mosquito nets is a major contributory factor to incidence of malaria related under-five morbidity and mortality. Most women were yet to embrace the use of mosquito treated nets despite increased awareness campaign among the populace. Funding of programs related under-five children is still largely inadequate. Most well-conceived policies and programs are donor driven, with no substantial funding coming from the public and private sectors. Deliberate policies should be made to equip the existing health centres with insecticide-treated nets (ITNs) or long-lasting insecticidal nets (LLINs) for free distribution to pregnant women on their first antenatal visits.

Many countries across Sub-Saharan Africa, including Nigeria are increasing insecticide-treated nets (ITNs) coverage to control malaria, but knowledge on the use of ITNs and factors affecting their use is inadequate. However, information on the proper use of the mosquito nets should be given

to them on the receipt of such nets. At the individual levels, the implementation of health education and promotion programmes, with respect to mosquito nets that are community-friendly and sustainable is also very important. This would go a long way in achieving the goal of universal access for the at-risk populations of children under age five and pregnant women in the study area and beyond.

All these could be achieved by mobilising effectively communities and organisations inspired by faith to advance the welfare of children and mothers. In Nigeria, traditional leaders are often on the front lines of changing behaviour.

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