

Assessing the Insecticide Treated Bed Nets (ITN) in the Prevention of Malaria Among Pregnant Women in the Nkoranza South District of Ghana

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Abstract

The main objective of this study was to assess the coverage of Treated Nets (ITNs) among pregnant women in Nkoranza South District. Coverage of possession of ITNs was assessed through descriptive cross sectional survey. The focus was on pregnant women in the study households of the twenty towns and villages. The sample size was obtained using statistical population proportion method. With this method the sample size was three hundred and eighty-four (384) pregnant women from the study communities. Structured questionnaire containing open and closed ended questions was employed to collect the data. The data was analysed using SPSS version 16.0 and Stata software. Descriptive statistics was employed in the analysis of field data. From the analysis of the data, 32% of pregnant women possessed ITN, 15% owned untreated bed net while 53% did not own any bed net. Most of the respondents' knowledge about malaria was very high, 83% were aware that malaria was caused through the bite of mosquitoes, they also have knowledge about the cause and symptoms. ITN coverage in this study was still low. Education on ITN should be intensified and more emphasis should be laid on the re-treatment of nets since culture of net re-treatment was very low in the district. More permanent conical nets should be imported for easy hanging even without beds and should be highly subsidized for all especially pregnant women.

Keywords

Insecticide, Treated Net, Malaria, Pregnant Women, Treatment

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1. Introduction

Malaria is an infectious disease which infects millions of people on the globe annually. The disease is a global health problem, which affect mainly young children especially those less than five years of age and pregnant women. However, everybody especially the non-immune is at risk of getting the disease. Malaria is caused by any of the human malaria parasites including; *Plasmodium falciparum*, *Plasmodium malariae* and *Plasmodium ovale*. The most virulent, common and dreaded malaria parasite is the *Plasmodium falciparum* [1, 2]. Malaria during pregnancy can cause severe anaemia,

miscarriage, still birth and maternal death. In endemic areas, it may account for up to 40% of preventable low birth weight among new born [3, 4]. It is also the single greatest risk factor for neonatal death [5, 6]. Evidence shows that pregnancy states are associated with decreased immunity; hence leads to increase frequency and severity of malaria. On the other hand, the falciparum parasites have effects on the mother and the unborn baby that leads to severe anaemia of the mother, intrauterine growth retardation of the baby and the increase risks of spontaneous abortions [7].

In Africa, 30 million women living in malaria-endemic areas become pregnant each year. For these women, malaria is a

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threat both to themselves and to their babies, with up to two hundred thousand (200,000) new born deaths each year as a result of malaria in pregnancy [8]. In 2000, in most African countries, few households owned nets and even fewer owned ITNs. Now in many African countries, the picture is beginning to change with net and ITN ownership increasing. This positive change can be attributed to reductions in taxes and tariffs in many countries, commercial market development, social marketing activities, demand creation and efforts to reach the most vulnerable populations with free or highly subsidized ITNs. Nevertheless, most African countries are struggling to attain the Abuja objective of 60% of pregnant women and children under five years of age sleeping under an ITN [9]. Evidence continues to accumulate to support the view that adults infected with HIV, in addition to pregnant women should be targeted for malaria prevention and treatment [10].

Malaria is hyper-endemic in Ghana and from recent baseline study, it is known to account for 44.5% of outpatient attendance, 36.9% of outpatient admissions. Again, in every hour four persons in Ghana die of malaria [11]. The total population of Ghanaians who sleep in insecticide treated bed nets is only 4.1%. Again, only 12.2% of households in Ghana, 9.1% of children under five years of age and 7.8% of pregnant women sleep under insecticide treated bed nets. It is also clear that ITN re-treatment rate among Ghanaians is very low [12]. In Ghana, many programmes employed by the Ministry of Health (MOH) and Ghana Health Service (GHS) including Roll Back Malaria (RBM) have failed to address the malaria problem. It is believed that insecticide treated bed net (ITN) is the most effective way of preventing malaria infections especially among pregnant women who are most vulnerable, yet the use of ITNs among Ghanaians is woefully poor. In 2003, only 12.2% households' use treated nets, 7.8% of the pregnant women sleep under treated net. The overall net usage among Ghanaian population was only 4.1% [12].

Reports show that malaria is the leading cause of OPD attendance (47%), OPD admissions (16.2%) and Hospital deaths (17.4%) in the Nkoranza South District in Brong Ahafo Region of which pregnant mothers are also affected [13]. The District's annual report for 2009 showed only 0.2% reduction of malaria amongst pregnant women who reported at the health facilities in the District despite massive distribution of ITNs to pregnant women in the district. Since 2007 to date in Nkoranza South District, over 7,510 ITNs have been sold to the population especially pregnant women [14]. Statistics on cases of malaria in 2007 was (45%), in 2008 (45%) were recorded as malaria cases while in 2009, (47%) were malaria cases. These findings indicate that there was no change in cases between 2007 and 2008 but there was an increase of 2% in 2009 cases [14]. It continues to be the leading cause of ailment in Nkoranza South District, though people especially

pregnant women patronize the purchase of the ITNs in the district and thus gives a cause to worry. Based on the above data, one will not be far from right if the researcher initiates a move to investigate the assessment of the coverage of the use of ITNs in the prevention of malaria among pregnant women in Nkoranza South District in Brong Ahafo Region, Ghana. The study was guided by these research questions - (1) To what extent are pregnant women aware of the use of ITNs in Nkoranza South District? (2) Are Insecticide Treated Bed Nets readily available and accessible in Nkoranza South?

2. Literature Review

The vision of the RBM Partnership is "a world free from the burden of malaria" [15]. As of 2007, the United Nations (through the MDGs), the World Health Assembly and the RBM Partnership had consistent goals for intervention coverage and impact for 2010 and 2015. Coverage is meant to reach $\geq 80\%$ year 2010 with four key interventions: ITNs for people at risk, appropriate anti-malarial medicines for patients with probable or confirmed malaria, Internal Residual Spray (IRS) for targeted households at risk and intermittent preventive treatment in pregnancy (in moderate-to-high transmission settings). The global impact targets are a reduction in the number of malaria cases and deaths per capita by 50% or more between 2000 and 2010, and by 75% or more between 2000 and 2015 [15].

2.1. Ownership

One of the strongest weapons in the fight against malaria is the use of insecticide-treated mosquito nets (ITNs) while sleeping. Research has shown that malaria incidence rates fall dramatically with the use of ITNs. Bed net usage is highly influenced by region of residence, food security and beliefs about malaria. It is on record that more people living in Afram plains in Ghana sleep under bed net be it treated or non-treated due to high presence of mosquitoes and malaria in the area [16]. A randomized control trial in Kasena-Nankana district in Ghana showed that out of 80% of women who had nets 70% of women used them frequently, and a study by Okra and Colleagues in 2002 showed that, 87% of respondents were interested in the future use of treated nets, mostly because they felt it would provide them with better protection against mosquitoes [17, 18].

In Africa, it is more difficult to precisely describe the current level of ITN coverage or the progress in increasing ITN coverage. Out of the 45 African countries where ITNs form part of the national malaria control strategy, 36 had a representative household surveys that measured usage of nets and/or ITNs at some point between 1999 and 2004. According to available surveys, only Eritrea, in 2003 reached the Abuja

target of 60% ITN usage [19]. In the 2008 GDHS, data were collected on whether or not households owned mosquito nets and if so, how many. Respondents were also asked a number of questions about each net they owned, including whether it had been treated with insecticide and if so, how many months ago it was most recently treated.

Finally, household respondents were asked to report the specific people in the household who had slept under each net the night prior to the survey. Less than half (45 percent) of households report owning a mosquito net; about one-third (33 percent) of households have an insecticide-treated net. This is a marked increase from 3 percent of Households with an ITN reported in the 2003 GDHS.

Although 41 percent of children under five and 32 percent of pregnant women were reported to have slept under a mosquito net the night preceding the survey, only 28 percent of children and 20 percent of pregnant women slept under a treated bed net [20]. Pregnant women who carry the malaria parasite may be at risk of serious problems that can jeopardize their own health, and that of the foetus, and that increase the likelihood of pregnancy complications that may result in stillbirth, spontaneous abortion, and low birth weight. Net ownership is quite encouraging but a lot needs to be done to increase coverage. It is on record that “net culture” is improving and expanding in many parts of Ghana. There is therefore the opportunity for stakeholders in ITN promotion to map up persuasive strategies to expand net ownership in Ghana. The focus now should be on availability and variety, on reducing the cost of ITN, on creating awareness of ITNs especially for vulnerable groups, on using motivational strategies to convert non-owners to owners [9].

2.2. Socio-Cultural Beliefs

A study in Accra, Ghana, showed that both rural and urban respondents use “fever” as a dominant term for malaria. The terms “fever” and “asra” were used interchangeably referring to a number of symptoms that when taken together, roughly correspond with a clinical diagnosis of malaria. Respondents mentioned various causes of “fever” including exposure to heat from sun or fire, eating oily or starchy food, mosquitoes and unhygienic surroundings [21].

In the Kilifi District, Kenya mild malaria was seen as related to mosquitoes. In addition to mosquitoes, some respondents believed that malaria spread through other ways such as weather changes (exposure to extreme cold or heat), getting wet and sharing of bedding and utensils. However, conditions such as convulsions, splenomegaly and anaemia, though acknowledge as serious childhood illnesses, and were not recognised as possible consequences of malaria. They were perceived as separate illness entities having different

aetiologies and therefore requiring different course of treatment. One of the ethnic groups in this district, the Mijikenda attributed the causes of convulsion to an “animal or bird” which enters the child, while the Luo, a neighbouring group ascribed convulsions to intestinal worms finding their way into the head of the child [22].

When developing interventions for populations with traditional beliefs and culturally defined behaviours, it is useful to classify such beliefs and behaviours and identify culturally appropriate means for modifying harmful beliefs and behaviours. Neutral beliefs can be left alone or if needed incorporated into health education messages. Even though it can increase the initial cost of programmes and interventions, the benefit of the effectiveness over time cannot be discounted [23].

2.3. Education on ITNS

Education and information are crucial elements of the efforts to increase ITN coverage in malaria endemic areas such as sub-Saharan Africa yet some campaigners do not give the correct message about ITNs. In some instances, also, the campaigners are misconstrued. In such situations it becomes difficult for the public to comply with the message on ITNs that they receive [23]. Frequent confusion arises in the distinction between insecticide treated nets (ITNs) and insecticide treated materials (ITMs). While the efficacy of the former has been clearly established the situation is not clear with insecticide treated curtains and other materials. The curtains and materials have been proven effective in preventing mosquito bites in Burkina Faso and Kenya. However, when the efficacy of treated bed nets was compared with that of curtains it was clear that the bed net was far better. In Madagascar, treated curtains did not have a significant impact on malaria transmission. It is unclear whether insecticide treated curtains in “real life” conditions in Africa would be effective as insecticide treated bed nets [24]. A study in Nigeria into households’ perception on malaria and ITN revealed that majority of the respondents had good knowledge about malaria and use of ordinary mosquito nets to prevent malaria. However, few knew about the existence of ITNs [25].

It is clear from the information provided in many health education campaigns in sub-Saharan Africa that there is still confusion surrounding effective methods of individual and community malaria control. For example, in many areas it is suggested that people and communities should cut the grass and bushes in their compounds as a means of malaria prevention. However, it has been shown that this does not reduce the incidence of Anopheles biting or malaria transmission and thus should not be part of malaria prevention messages [26].

In Ghana, despite the high level of knowledge about malaria, the use of bed net (ITN) is inadequate. If the lives of vulnerable Ghanaian children and pregnant women are to be protected, efforts to improve the use of bed nets must extend beyond sharing information about the benefits of ITN use. Such efforts must address socio-cultural, economic and other determinants of behaviour. Educational messages must be culturally sensitive and capitalise on positive beliefs and behaviours that already exist in local communities. Likewise, programmes that mobilise communities play central role in the adoption of preventive behaviours [16].

3. Methodology

The study was conducted in twenty communities in Nkoranza south municipality within the period of July and October, 2010 after ethical approval from the Committee on Human Research Publication and Ethics (CHRPE), School of Medical Sciences, SMS, of the Kwame Nkrumah University of Science and Technology, KNUST and the municipal health directorate of Nkoranza south. All study subjects gave their consent before questionnaires were administered.

The study was a descriptive cross sectional design – using questionnaire-open and closed ended. The study was basically observational without any interventions. A descriptive cross sectional design was used to collect data from a section of the population in the Nkoranza South District. Data on insecticide treated net ownership, awareness and acceptance was obtained from the study subjects one at a time. Background information such as age, marital status, socio-economic status, religion was also obtained. Both qualitative and quantitative data were collected for the study. The study engaged households in selected communities within the Nkoranza South district. The focus was on pregnant women in the study households. Subjects were drawn from a number of communities within the Nkoranza South district.

A total of 384 pregnant women were selected for the study. A mix of sampling methods was used in selecting the 384 study subjects. This included cluster sampling, simple random and systematic sampling methods. A simple random sampling technique was used to select twenty (20) communities and each community then formed a cluster. Subjects were selected from each cluster systematically. The sample frame was the total number of households within the study communities. Each household then constituted a sample unit. The sample size was obtained using statistical population proportion method,

$$n = \frac{z^2 p(1-p)}{d^2}$$

Where, n = estimated sample size

P = sample proportion (the proportion of the sample that is assumed to be using ITNs = 50% or 0.5);

d = the probability that the desired sample size will not be representative of the study population (5%);

Z = level of confidence that the chosen sample will be representative of the population (95%).

The assumption that 50% or 0.5 of the sample using ITNs is based on the fact that there is no baseline data from the district hence half of the population is assumed to be using ITN. Below is the sample size calculation;

$$\begin{aligned} n &= \frac{1.962 \times 0.5 (1 - 0.5)}{0.05^2} \\ n &= \frac{3.8416 \times 0.5 \times 0.5}{0.0025} \\ n &= \frac{0.9604}{0.0025} \\ n &= 384.16 \\ n &= 384 \end{aligned}$$

Prepared questionnaires containing open ended and closed ended questions were given out to the study subjects to respond with the aid of research assistants. The research assistants administered the questions to the respondents' one at a time. They read out the questions and interpreted them to the respondents in a local language (Twi) after which the response from the respondents were recorded accordingly.

3.1. Pre-Test of Data Collection Instruments (Tools)

Data collection tools such as the questionnaire and checklist was tested in a pilot study before the actual collection of data. This was to test the validity and reliability of the instruments. The pre-test or pilot study was conducted on pregnant women in a non-study community within the Nkoranza south district. Any faulty tool was redesigned or replaced after the pre-test.

3.2. Study Variables

Variables for this study are categorized into dependent and independent variables as shown below;

Dependent variable: Insecticide Treated Nets (ITNs) coverage and use in the Nkoranza south district. Independent variable: Affordability, Ownership, Socio-cultural beliefs, Acceptance of ITN and Education (awareness) on ITN.

Table 1. Study variables.

Variable (conceptual definition)	Operational definition (indicator)	Scale of measurement
Affordability of ITN	Cost of ITN	Discrete e.g. cost in cedis
Awareness of ITNs	Knowledge and understanding of ITN by pregnant women	Ordinal e.g. low, high
Frequency of ITN Education	Number of times pregnant women receive ITN Education in a year	Discrete e.g., 3 times
Availability of ITNs	Accessibility of ITN to pregnant women (public)	Nominal e.g. accessible, not accessible
Compliance with ITN message	Level of pregnant women compliance with ITN message	Ordinal e.g. low, high
Rate of ITN usage	Percentage of pregnant women who own and use ITN	Continuous e.g. 30%
Acceptance of ITN	Pregnant women perception about ITN	Nominal e.g. positive, negative
Age of pregnant woman	Age of pregnant woman at last birthday	Discrete e.g. 19 years
Education of pregnant mother	Level of education of pregnant mother	Nominal e.g. JHS, SHS, Tertiary
Occupation of pregnant mother	The type of job pregnant mother does for living	Nominal e.g. farming, trading etc
Marital status of pregnant mother	Whether pregnant mother is married or not	Nominal e.g. single, married, divorced, widow
Number of children of pregnant mother	Number of children ever born including those dead by pregnant mother	Discrete e.g. 3
Religion of pregnant mother	Religious affiliation of pregnant mother	Nominal e.g. Christian, Islam etc
Malaria cases among pregnant mothers	Whether pregnant mother in a household has ever had malaria in the last month	Nominal e.g. Yes, No

Source: Author's own construct.

3.3. Ethical Consideration

The study protocol was reviewed and approved by the Ethical Review Committee (CHRPE) KNUST School of Medical Sciences. Copies of an introductory letter obtained from the department of community health, school of medical sciences, KNUST was presented to the Brong Ahafo regional director of health services, Nkoranza south district director of health services, Nkoranza South District Assembly and the medical superintendent of Nkoranza south district hospital to notify them of the research and its purpose. At the beginning of the data collection exercise, the principal researcher met all chiefs and opinion leaders of the study communities and also sought their consent for the study. In consultation with the opinion leaders and chiefs, meetings were convened to formally introduce the research team to the people in the communities and explain to them the purpose of the study.

3.4. Data Analysis

Data collected was analysed through the use of computer to construct tables and charts. Computer software Statistical Package for Social Science (SPSS) version 16.0 was used for the data entry and analysis was done using Stata software. The data from the questionnaire was coded and fed into the computer for onward analysis based on the study objectives and the main study variables. Descriptive statistics was employed in the analysis of data collected from the field.

4. Findings and Discussions

This section shows the results of three hundred and eighty-four (384) pregnant women interviewed in Nkoranza South district on Affordability, Ownership and use, Socio-cultural beliefs, Acceptance and Education (awareness)

on ITN. The mean age of respondents was (26.03) with SD of (6.23). Fifty-four percent 207 (54%) were married, forty-four percent 170 (44%) were single while one percent 4 (1.0%) was widows and one percent 3 (1.0%) were divorced. Twenty-one percent (21%) had no formal education. Forty-four percent (44%) have had JHS/Middle School education. Eight percent (8%) of the respondent had secondary education with three percent (3%) having tertiary education while twenty-four percent (24%) had only primary education. Farming constituted thirty-one percent (31%) of the respondents' occupation while thirty-four percent (34%) were unemployed and others constituted thirty-five percent (35%) of the respondents'. The women had an average of 1.83, SD = 1.70 children. Fifty-one percent (51%) had less than four (4) children while 34% had no child before the survey and 15% had four or more children.

4.1. Pregnant Women Cognition ITNs

This sub-section was guided by the research question; To What Extent Are Pregnant Women aware of the use of ITNs in Nkoranza South District?

Table 2. Awareness, symptoms, means of preventing malaria and perceived use of ITN.

Variable	Frequency	Percentage (%)
Awareness of malaria (n=384)		
Mosquito bite	318	83
Overwork	21	6
Exposure to sun	36	9
Malnutrition/witchcraft	9	2
Total		
Symptoms of malaria (n=384)	384	100
High temperature	118	30.73
Headache	32	8.33
Vomiting	28	7.29
Shivering	56	14.58
Yellowish eyes	43	11.20
Weakness	33	8.59

Variable	Frequency	Percentage (%)
Loss of appetite	74	19.27
Total		
Means of preventing malaria (n=384)	384	100.00
Sleeping under bed net	153	40
Clean environment	149	39
Taking antimalarial weekly	39	10
Avoiding excessive heat	25	6
Good personal hygiene	6	2
Others	12	3
Total	384	100.00

Eighty-three percent 318 (83%) knew that malaria is caused through the bite of mosquitoes, six percent 21 (6%) associated the cause of malaria to over work while nine percent 36 (9%)

said malaria is caused by exposure to sun/heat and the remaining two percent 9 (2%) attributed the cause of malaria to malnutrition and witchcraft. The women identified high temperature 118 (30.73%), headache 32 (8.33%), vomiting 28 (7.29%), shivering 56 (14.58%), yellowish eyes 43 (11.20%), weakness 33 (8.59%) and loss of appetite 74 (19.27%) as symptoms of malaria. Forty-six percent 176 (46%) perceived that malaria can spread from one person to another with thirty-two percent 122 (32%) objecting to the spread of malaria from one person to another while twenty-two percent 86 (22%) claimed they did not know. The detail is shown in the figure 1 below.

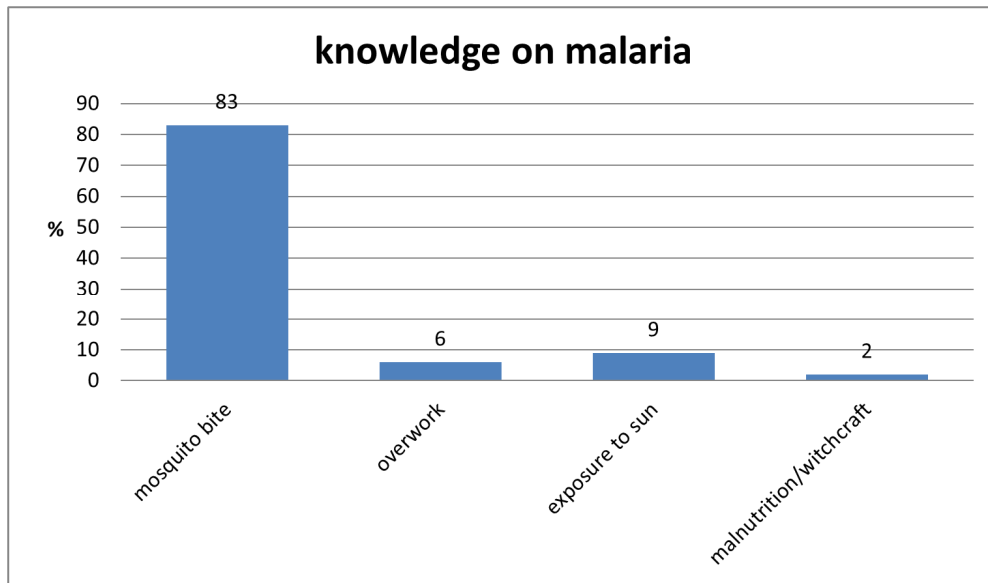


Figure 1. Knowledge on malaria.

Source: Field survey, 2010.

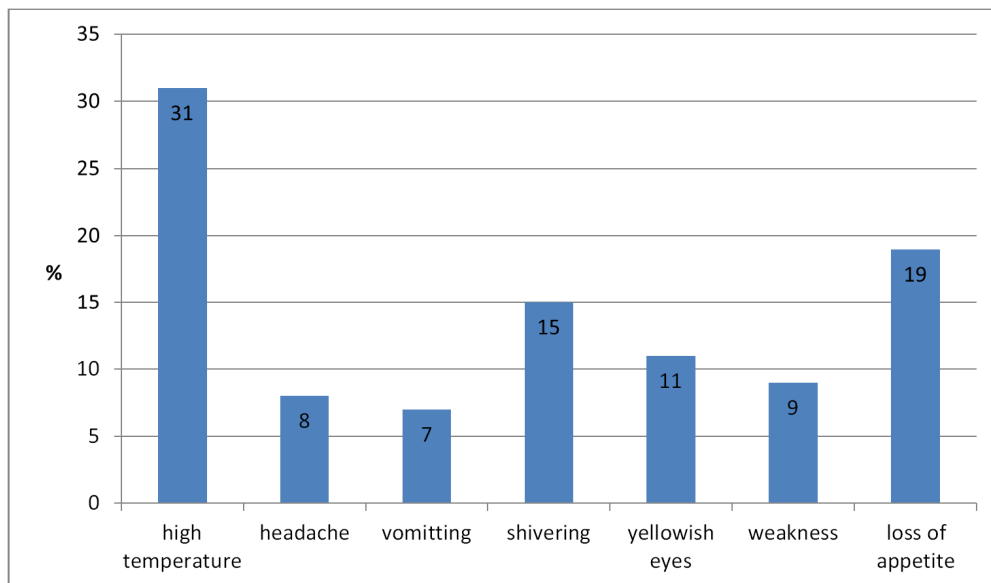


Figure 2. Signs and symptoms of malaria as described by respondent.

Source: Field survey, 2010.

4.1.1. Means of Preventing Malaria Among Pregnant Women

Forty percent 153 (40%) identified sleeping under a bed net as a means of preventing malaria. Clean environment 149 (39%),

taking anti-malarial weekly 39 (10%), avoiding excessive heat 25 (6%), good personal hygiene 6 (2%) and others 12 (3%) were also identified as means of preventing malaria shown in figure 3 below.

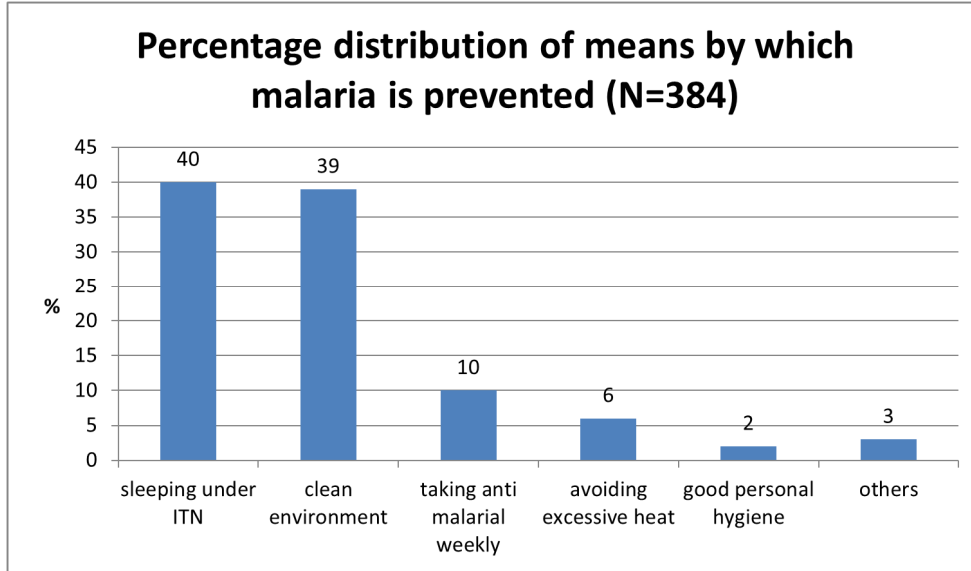


Figure 3. Percentage Distribution of means by which Malaria is prevented (N=384).

Source: Field survey, 2010.

4.1.2. Knowledge on ITNs and Its Perceived Use

When respondents were asked on whether they have heard about ITN, sixty-three percent 243 (63%) responded in the affirmative while thirty-seven percent 141 (37%) said they

have not heard about ITN at all. With the 63% who have heard about ITNs, ninety-five percent 230 (95%) said it is used as a protection against mosquito bite, three percent 7 (3.0%) attributed its use to room decoration while two percent 6 (2.0%) said it affords good sleep.

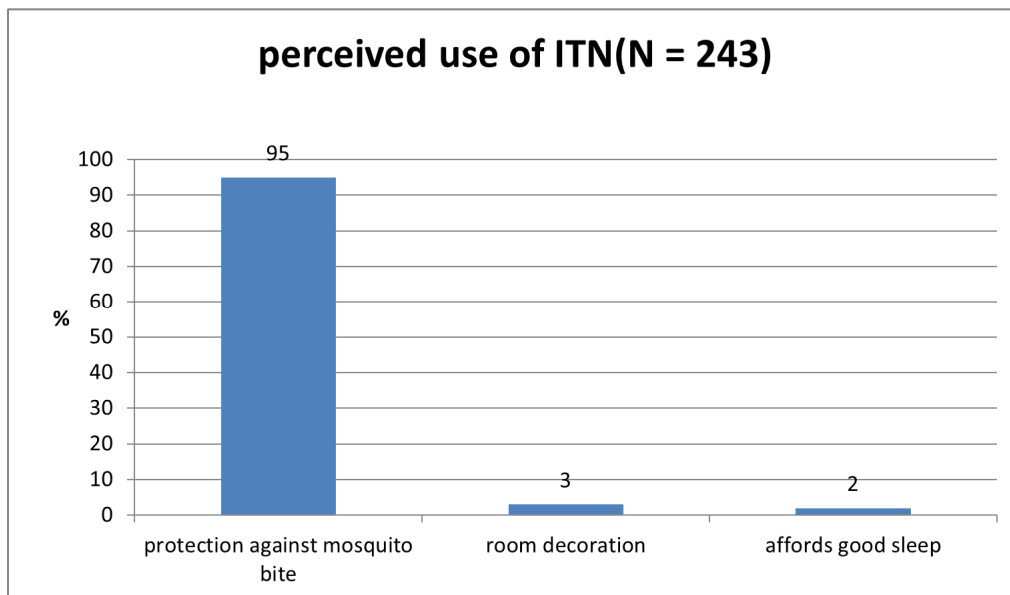


Figure 4. Use of ITN as described by respondents (N=243).

Source: Field survey, 2010.

The figure 5 gives the source where pregnant women acquired information on ITN. 138 (57%) of the women received their information through the TV/FM stations, 83 (34%) had their

information from Hospital/Clinic whilst 12 (5%) received theirs through District Health Education and 10 (4%) had their information from relatives/peers.

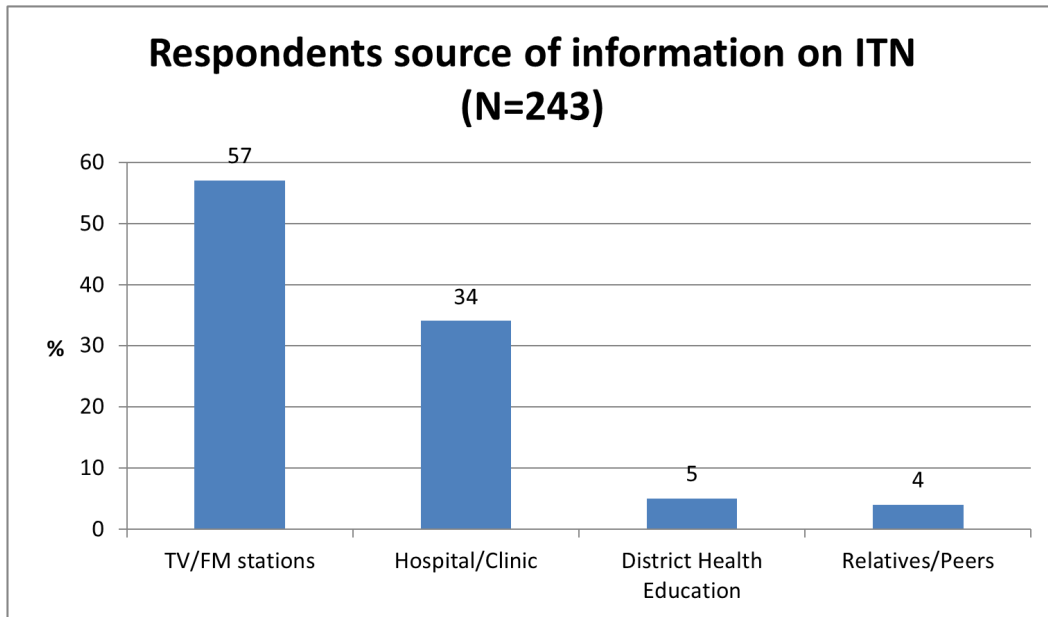


Figure 5. Respondents source of information on ITN.

Source: Field survey, 2010.

4.2. Availability and Accessibility of Insecticide Treated Bed Nets

This sub-section was also guided by research question two: *Are Insecticide Treated Bed Nets readily available and accessible in Nkoranza South?*

4.2.1. Availability of ITN

Out of the 179 respondents who possessed mosquito bed nets, 61 (34%) knew that mosquito nets were available in the community while 118 (66%) said it was not available as at time of the survey as illustrated in the figure 6 below.

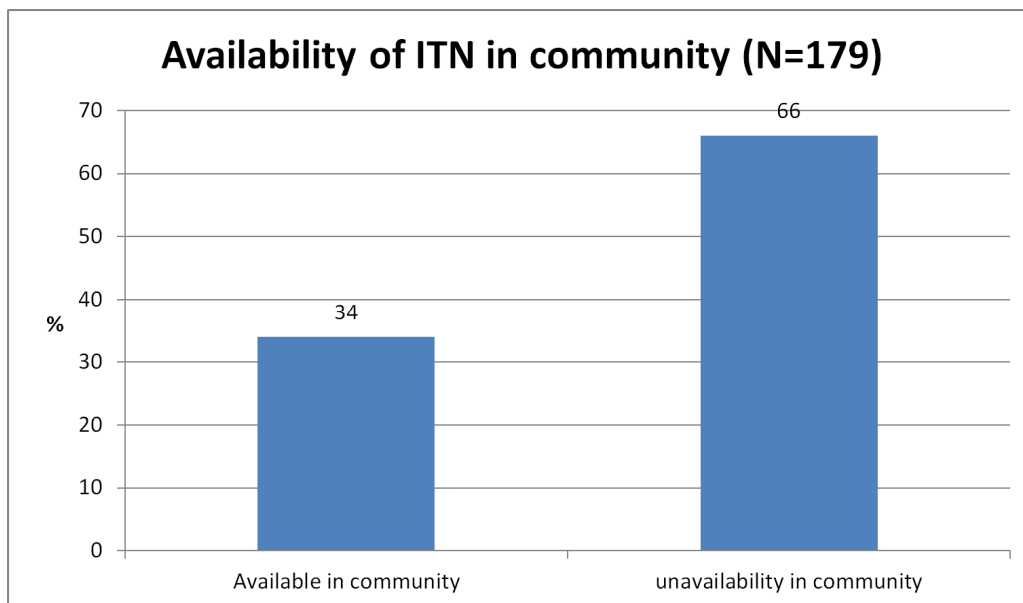


Figure 6. Availability of Treated Mosquito Bed Nets in the Community (N=179).

Source: Field survey, 2010.

Table 3. Place of purchase and cost of ITN (n=179).

Variables	Frequency	Percentage (%)
Source of purchase		
Hospital/clinic	84	47
Pharmacy	37	21
Supermarket	31	17
Community volunteers	27	15
Cost of Nets		
Gh¢ 2.0-Gh¢ 3.0	48	27
Gh¢ 5.0	74	41
Others	57	32
Sold in this town		
Yes	61	34
No	118	66

Source: Field survey, 2010.

4.2.2. Accessibility and Cost of ITN

Among 179 pregnant women who had nets in the communities, 84 (47.0%) obtained it from Hospital/Clinic, 37 (21.0%) had it from pharmacy shops, 31 (17.0%) had theirs from the supermarket and 27 (15.0%) from community volunteers as shown in the diagram below. The average cost of ITN was 3.49 with SD of 1.32 and ranged from Gh¢ 2 to Gh¢ 7.00 per piece. Out of the 179 who had mosquito bed nets, 48 (27%) obtained it below Gh¢ 4.0 whilst 74 (41%) bought it at a cost of Gh¢ 5.0 with the others 57 (32%) as a gift during the Ante Natal Clinic (ANC) or bought above Gh¢ 5.0.

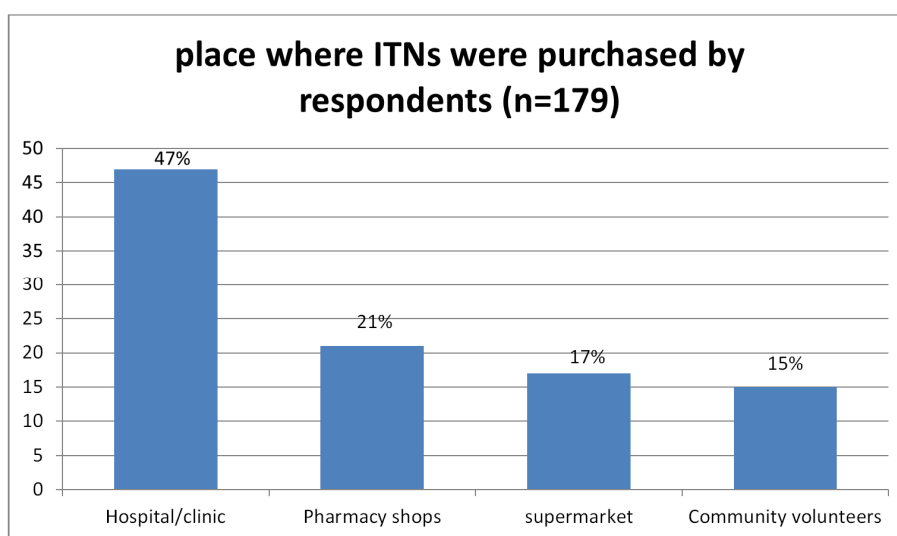


Figure 7. Percentage distribution of place where ITNs were Purchased (N = 179).

Source: Field survey, 2010.

4.2.3. Willingness to Purchase

Table 4. Respondents' willingness to purchase ITN.

Variable	Frequency.	Percentage
Willing to buy		
Yes	279	73
No	105	27

Source: Field survey, 2010.

When pregnant women were asked about their desire to purchase ITN in future, majority of them 279 (73%) responded in the affirmative "Yes" while 105 (27%) said "No".

4.2.4. Ownership of ITN

The table 5 indicates that 179 pregnant women representing 47% had bed nets whilst 205 representing 53% did not own any net. However, with respect to the 384 women interviewed, 32% possessed ITN whilst 15% owned any untreated bed net.

A further examination of net possession with focus on ITNs revealed that out of 179 respondents that had mosquito bed nets, 122 (68%) had ITNs whilst 57 (32%) owned other bed nets as illustrated in the figure below. Monthly expenditure did not show any significant association with ownership of net (chi square 8.34, p-value = 0.14). Below is a table showing the summary of Net ownership among respondent.

Table 5. Possession of Nets (Treated and Untreated, n=384).

Variable	Frequency	Percentage (%)
ITN	122	32
Untreated net	57	15
No net	205	53
Total	384	100

Source: Field survey, 2010.

4.2.5. Strategies for Improving Coverage of ITN

More than half 200 (52%) of the pregnant women suggested

that the nets should be given free as a means of increasing coverage, 116 (30%) said the price of the nets were expensive and should be reduced so as to boost the coverage and 68

(18%) also suggested that massive education should be embarked upon to enhance the coverage.

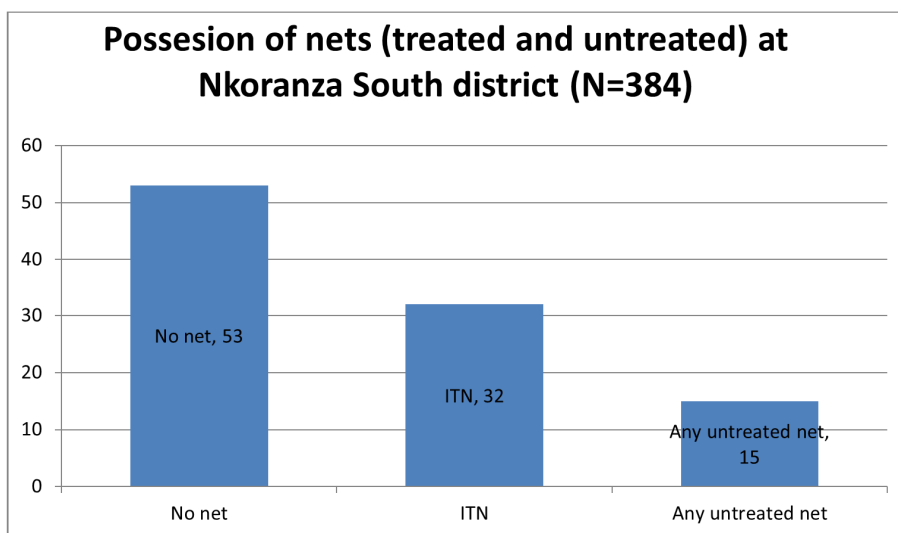


Figure 8. Percentage of respondents with Bed Nets.

Source: Field survey, 2010.

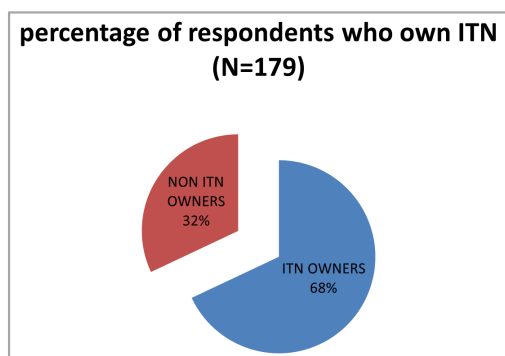


Figure 9. Percentage Distribution of Pregnant Women that Possess ITN (N=179).

Source: Field survey, 2010.

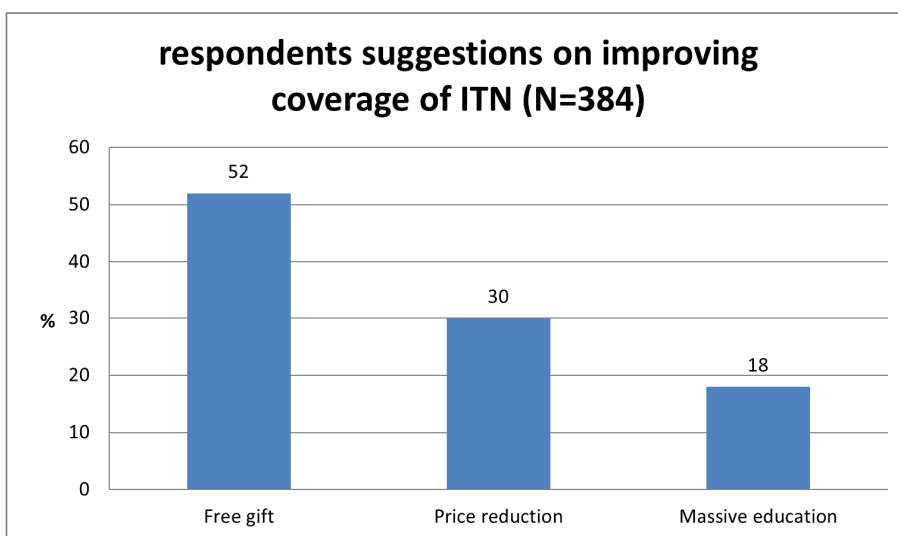


Figure 10. Respondents' suggestions on improving coverage of ITN.

4.2.6. Knowledge on ITNs

Out of the 384 pregnant women interviewed, 243 representing 63% of the women said they have heard about ITN which signals that knowledge on ITN in the district was relatively high. This is in contrast with a study conducted by Onwujekwe and others in 2000 and Alaii J. A and others in 2003 in Nigeria and Western Kenya respectively on malaria and ITN which said that few households knew about the existence of ITNs [27].

4.2.7. Accessibility and Cost of ITN

Most of the nets, 53% were purchased from supermarkets, pharmacy shops and community volunteers. This is in support of a study in four Kenyan districts by Guyatt and others in 2004 which showed that the commercial sector was an important source of nets. The remaining (47%) of the nets were purchased from Hospitals/Clinics and this was mostly done during the Antenatal care (ANC) services for only pregnant women. Again, out of the 179 women who had nets, 61 representing 34% new of the availability of nets in the community while 118 representing 66% said it was not available in their communities unless they travel to the nearest clinic or sale outlet before they could purchase. The pregnant women asserts that Cost of nets at the Hospitals/Clinics were cheaper than in commercial centres such as Pharmacy shops and supermarkets. “The cost of an ITN is a major barrier to ownership and usage for a proportion of Africans who are among the poorest of the poor and also the most highly affected by malaria” [2]. Equally, this study agrees with WHO malaria report, 2009 that, “ITNs should be either free of charge or highly subsidized. Cost should not be a barrier to making them available to all people at risk, especially young children and pregnant women” [14].

In fact, this study supports the assertion that, “Improvement in ITN coverage depends so much on the accessibility of the ITNs to the people. Making the nets and insecticides available to the public at affordable prices is a key to achieving high ITN coverage” [27]. More than 72% had not re-treated their nets since they purchased it which signals the culture of non-maintenance or treatment of nets by respondents and this may be due to ignorance on the part of the pregnant women or that the District Health Management Team fail to provide re-treatment education through the district outreach programmes to the public. The rest which constituted 28% treat at least in every six months and purport that the re-treatment drugs were added to the nets when they purchased them. This shows that users of the net had little or no knowledge on re-treatment of net.

4.2.8. Possession of ITN

Coverage of ITN among pregnant women was thirty-two

percent (32%) and fifteen percent (15%) had any untreated net while fifty-three percent (53%) had no nets. Though knowledge on ITN was high (63%), it did not have direct bearing of increase in the possession of ITN in the district which is far below the Abuja target of 60% by 2010 [9] and that of the global coverage which is meant to reach greater than 80% in the same year 2010 [14] in spite of the ITN intervention in the district for the past three years. But this study shows a remarkable improvement of pregnant women’s possession of ITN (32%) compared to the national ITN possession by pregnant women which was 20% 20. However, the household ownership (32%) was almost equal the National household ownership of 33%. The overall coverage for both treated and untreated nets was 47%. This showed that 53% of pregnant women in the district did not have nets.

5. Conclusions

The revealed that, most of the respondents’ knowledge about malaria was very high. They have knowledge about the cause and symptoms. The study showed that, majority of the pregnant women were aware that ITN offers protection against mosquito bite. However, most of the respondents had no knowledge on the availability of nets in the community. Cost of ITN was found to be expensive especially from the commercial centres and therefore not affordable. The study also concluded that, ITN coverage in this study was still low (32%) compared to the Abuja RBM target of 60% by 2010 in spite of subsidies for pregnant women and children under five years of age. But with a change in strategy to subsidize for all, coverage could increase by an appreciable margin in the near future.

6. Recommendation

Its recommended that, Education on ITN should be intensified and more emphasis should be laid on the re-treatment of nets since culture of net re-treatment was very low in the district. More permanent conical nets should be imported for easy hanging even without beds and should be highly subsidized for all especially pregnant women. ITNs should be distributed freely to all in the communities as the best means of expanding coverage of ITNs.

Author Contributions

Conceptualization, R. O, C. K. and K. A. B; methodology, K. A. B. and R. O.; validation, R. O, C. K. and K. A. B.; formal analysis, K. A. B.; investigation, R. O.; resources, R. O.; data curation, C. K.; writing—original draft preparation, R. O.; writing—review and editing, K. A. B.; visualization, C. K.;

supervision, R. O.; project administration, C. K. and K. A. B. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

Data is available on request from the corresponding author.

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