DISTRIBUTION AND UTILIZATION OF INSECTICIDE TREATED NETS (ITNS) IN DONGA LOCAL GOVERNMENT AREA, TARABA STATE NIGERIA.

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Abstract: There have been reports on the positive association between Insecticide Treated Nets and malaria control. However, previous reports show that there are marked variations in factors affecting ownership and utilization of ITNs amongst different populations. It is in this light that this study on the ownership and use of insecticide treated nets in Donga Local Government Area of Taraba State, Nigeria, was carried out. About 603 persons were examined for malaria parasites, 309(51.3%) were positive. Highest prevalence of malaria infection was recorded among males (56.6%) and among those aged group 20 – 44 years (35.3%). Malaria parasite prevalence was slightly higher ($p>0.05$) among non-users of ITNs compared with users. A total of 735 individuals were interviewed using structured questionnaires. About 431(58.6%) of the participants owned at least one ITN, 356(82.6%) hanged their nets and 359(48.8%) slept under their nets. Out of the currently used nets by the respondents, 37.1% were worn-out, while the remaining 62.9% were intact. Though more males (52.4%) possessed ITNs, rate of usage was slightly higher among the females (50.3%). Those aged 20 – 40years (34.6%) had the highest ITNs possession while aged group 5 – 19 years (34.8%) had the highest ITNs hanging and use (35.4%). It is concluded that there was high rate of hanging and use of ITNs but there is poor ownership in the study area, although the high prevalence of malaria in the area remains a great concern. It is recommended that more awareness should be created on the ownership and best practices for the hanging and use of Insecticide Treated Nets.

Keywords: Distribution, Possession, Utilization, Malaria, Infection, Insecticide,

Introduction

Malaria, caused by a protozoan parasite of the genus *Plasmodium*, is one of the most important and devastating infectious diseases, particularly, in the developing countries (Mark, 1998). Malaria is a major public health problem in tropical and subtropical regions of the world, especially among pregnant women because of the associated maternal and perinatal morbidity and mortality (Ozims and Eberendu, 2014). Ninety percent of global cases of malaria occur in poor tropical and sub –tropical regions of the world, mostly in Africa, South of the Sahara (Mc. Gregoneta, 2003). The disease is transmitted from one person to another through the bites of infected female *anopheles* mosquito vectors during blood meal (Abbey, 2010). The World Malaria Report of 2022 by WHO stated that despite continued impact of COVID19, Malaria cases and deaths remained stable in 2021. The 2022 edition of the report finds that, despite disruptions to prevention, diagnostic and treatment services during the pandemic, countries around the world have largely held the line against the further setback to malaria control. There were estimated 619,000 malaria deaths globally in 2021 compared to 625,000 in the first year of the pandemic in 2019, before the pandemic struck, the number of deaths stood at 568,000. Malaria cases continued to rise between 2020 and 2021, but at a slower rate than in the period of 2019 to 2020. The global tally of malaria cases reached 247 million in 2021, compare to 245 million in 2020 and 232 million in 2019 (WHO, 2022). The burden of malaria is largely borne by Africa; Nigeria accounted for the highest proportion of cases globally (27%), followed by the Democratic Republic of the Congo (10%), India (6%), and Mozambique (4%) (WMR, 2017). 57% of African population lives in areas at risk of malaria, even though there is decrease in malaria infection in children in Africa in recent years, with about 100 million people living in areas where malaria transmission is now relatively low (Afolabi, 2004). In Nigeria, malaria is highly endemic and remains one of the most leading causes of morbidity and mortality and presents major socio–economic challenges. It accounts for 30% childhood mortality and 11% maternal mortality (Akogun and Kauna, 2005). Attempts for preventing the disease through anti-malarial drugs and insecticides is threatened due to the emergence and spread of drug resistant malaria parasite and insecticide resistant vectors (Greenwood *et al*., 1987). Though ITNs remained the choice tool especially against the vector. This is possible because the insecticides on the nets have been modified to cater for the resistance strains of the mosquitoes. For this reasons, there is need for 85% coverage of ITNs so that the efforts made would be effective (WHO, 2014). Insecticide-treated nets (ITNs) have become the most prominent malaria preventive measure for large-scale deployment in highly endemic areas. There is strong evidence of Insecticide-Treated Nets efficacy in reducing malaria prevalence, incidence and child mortality in Africa (Aliyu and Muazu, 2009). Consequently, the Federal Ministry of Heath, in conjunction with World Health Organization (WHO) Roll Back Malaria (RBM), has adopted plans to prevent malaria with key interventions in vector control, including the use of Insecticide-Treated Nets (Sa'ad *et al*., 2008).

Consistent use of the nets is required for maximum effectiveness; but studies indicated that the nets are often jettisoned in period of low mosquito activities and high night temperature. The use of ITNs in Africa remains low

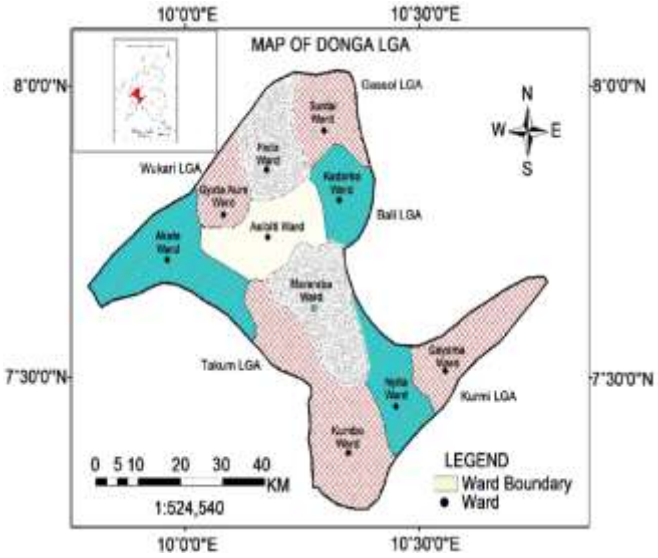
because of cost and logistics (Kachur, 2007; Wacira *et al*., 2007; Belay and Deressa, 2008). This is further complicated by many factors including culture, knowledge, lack of value attached to ITNs products and overall belief about ITNs use and the socio-economic status of malaria endemic communities (Bejon *et al*., 2009; Matovu *et al*., 2009; WHO, 2011).

Despite awareness in some areas, low rates of ownership prevailed due to belief that ITNs cannot protect them against malaria. Malaria infection is a severe health problem among people, most especially pregnant women and children under five because of their low immunity. Nigeria is known for high prevalence of the disease and it is the leading cause of morbidity and mortality to the country. Different methods of vector control have been proposed by researchers. An important innovation during the past decade is the wide spread distribution of ITNs for prevention of malaria transmission (Justin *et al*., 2013). This study was carried out because there was no any documented information about the status of ownership and use of ITNs as well as the conditions of ITNs and the prevalence of malaria parasites in the communities of Donga Local Government Area, Taraba State Nigeria.

Materials and Methods

Study Area

The study was conducted in Taraba State which is located in the north eastern part of Nigeria on latitudes 6º 25" N and 9º 30" N, of the equator, and longitudes 9º 30"E and 11º 45"E, of Greenwich Meridian. It has a total area of 54,473 square kilometers and a total population estimated to be 2,294,800, where 1,171,931 were Males and 1,122,869 were females. The state has international boundary with the republic of Cameroon along the eastern border, it share boundary with Adamawa State in the North East, Gombe, Plateau and Nasarawa State in the West, Benue State in the South East. It has sixteen Local Government Councils. The study was carried out in Donga Local Government Area Taraba State Nigeria. Donga Local Government is located at the Southern Guinea Savannah with co-ordinate latitude 74259.99"N and 1002'60.00"E, with annual precipitation of 1203mm, It has an average temperature of 32 degree Centigrade while the humidity level of the Local Government Area is at an average of 17%, and it has an area of 3,121km (1,205sqm) and a population of 134,111 (NPC, 2006). The study was conducted in all the ten (10) wards of Donga Local Government Area namely Akate, Asibiti, Fada, Gayama, Gyatta Aure, Kadarko, Kumbo, Mararaba, Nyita, Suntai.



Data collection

The type of study is a cross-sectional community based in which a multiple-stage approach consisting of both the qualitative, quantitative and laboratory techniques were used in data collection. A total of 735 participants were randomly selected from ten (10) wards of the Local Government.

The study included, but not exclusively, households with pregnant women and children aged under 5. Structured questionnaires were administered to households to obtain information on sex, age, possession, utilization, and condition of the nets. Data on influence, cultural factors and perception of the people were collected using In-depth interview guide. The respondents were the participants as well as officers in charge of primary health facilities, Roll-back malaria focal persons, ward health supervisors.

Determination of malaria parasite

The site (fingertip) was cleaned with cotton wool soaked in 70% ethanol as described by (Cheesbrough, 2000). The finger was punctured using a sterile lancet and a drop of blood was dropped to the slide. Using the edge of another slide the blood was smeared gently to make a thick film and allowed to dry. The film was then dipped into10% Giemsa stain in a coupling jar and allowed to stain for ten minutes. Using clean water, the film was then washed and placed in a draining rack to dry. A drop of oil immersion was applied to the area of the film, the area was examined for malaria parasites under the light microscope using x100 objectives and *Plasmodium falciparum* was seen as a ring structure as described by (Cheesbrough, 2000), and the result was recorded in the table.

Data Analysis

Data obtained were managed using SPSS version 20. Chi-Square were used to test the association between possession, use of ITNs with sex and age, as well as the association between the rate of malaria infection with sex and age at 95% confidence interval ($P<0.05$).

Results and Discussion

The result showed that the prevalence of malaria was 175(29.1%) and (56.6%) according to sex, males had the highest prevalence of malaria infection as shown in Table 1. Chi-square test showed that there is no significant association between malaria infection and sex (x^2 cal=1.053, x^2tab 1df=3.841, p>0.05).The age prevalence of malaria infection also shown that age group (20-44) years had the highest prevalence of malaria infection of 109(18.9%) and (35.3%) as presented in Table 1. Chi-square test showed that there is no significant association between malaria infection and age(x^2 cal=1.153, x^2tab 1df=3.841, p>0.05).

On the prevalence of malaria and use of ITN, the result showed that out of 359 of those that sleep under the ITNs, 335 were examined and 141 (23.4%) were positive and (45.6%) prevalence within malaria infection. While out of 376 of those that do not sleep under the ITNs, 268 were examined and 168 (27.9%) were positive and (54.4%) prevalence within malaria infection as shown in Table 1. Chi-square test showed that there is significant association between sleeping under the ITNs and malaria infection (x^2 cal=9.361, x^2tab 1df=3.841,p<0.

Table 1: Malaria Infection and Sex, Age

		Number Examined	Number Positive	Prevalence
Sex	**Male**	336	175	56.6
	Female	267	134	43.4
	Total	603	309	100
Age	**<5**	132	69	22.3
	5 – 19	199	101	32.7
	20 – 44	213	109	35.3
	45 – 60	36	17	5.5
	>60	23	13	4.2
	Total	603	309	100
Sleep under ITNs	**Yes**	335	141	45.6
	No	268	168	54.4
	Total	603	309	100

A total of 735 household members were enrolled in this study. The ownership and use of ITNs according to sex shown that 431(58.6%) of households owned at-least one ITNs as presented in the Table 2. ITNs ownership was higher among males (52.4%) than among females (47.6%), with a statistically significant association between ownership of ITNs and Sex (P<0.5). ITNs hanging and use was significantly (P<0.05) higher among females than among males.

Table 2: Sex Related Possession and Utilization of ITNs

Sex	Own ITNs		Hang ITNs		Sleep under ITNs		Total Examined	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Male	226	52.4	177	49.7	179	49.9	420	57.1
Female	205	47.6	179	50.3	180	50.1	315	42.6
Total	431	100	356	100	359	100	735	100

Ownership of ITNs was highest among respondents aged 20 – 44years where 149(34.6%) owned ITNs. Chi-square analysis shows that ownership of ITNs was not significantly associated with age (P>0.05) in the study area. Age group 5 – 19 years recorded the highest ITNs hanging with (34.8%), followed by age group 24 – 44 (31.5%), while age group >60 years recorded the least percentage ITNs hanging with 11(3.0%) as presented in Table 3. Chi-square analysis shows that hanging ITNs is significantly associated with age (P<0.05). More of those age 5 – 19 years(35.4%) slept under ITNs than among any other age group, although no statistically significant association was found between age and sleeping under ITNs (P>0.05).

Table 3: Age Related Possession and Utilization of ITNs in Donga LGA

	Own ITNs		Hang ITNs		Sleep under ITNs		Total Examined	
Age	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
<5	101	23.4	86	24.2	85	23.7	159	21.6
5-19	139	32.3	124	34.8	127	35.4	247	33.6
20-44	149	34.6	112	31.5	113	31.5	257	35.0
45-60	29	6.7	23	6.5	23	6.4	44	6.0
>60	13	3.0	11	3.0	11	3.0	28	3.8
Total	431	100	356	100	359	100	735	100%

About 735 members of households interviewed, 431 possessed at least one ITN. While 160(37.1%) of these were worn-out, the remaining 271 (62.9%) were intact (not worn-out) as presented in Table 4. It was concluded that the ITNs that were available are in functional conditions and very effective in the control of malaria.

Table 4: Functional Condition of the Available ITNs

ITNs Functional Conditions	No. of ITNs	% Within ITNs Possession
Torn	160	37.1
Not torn	271	62.9
Total	**431**	**100**

The result for malaria prevalence shows that prevalence was higher among males than among females. This is lower than the 65.7% and 57.9% reported among males and females in Anambra State (Pauline, 2011). The result, however, is higher than the 27.6% and 39.6% reported among males and females settler Fulani pastoralist in Southern Nigeria (Ekpo *et al*., 2008). The prevalence of malaria was highest among those aged 20 – 44 years and lowest among those aged >60 years. The overall prevalence found in this study is higher than the findings of (Aribodor *et al*., 2003) who reported a prevalence of 33%.

Studies show proper use of ITNs to be effective in the protection against malaria infection. In the present study prevalence of malaria was higher among non-users of ITNs. This agrees with the findings of (Abdissalam *et al*., 2009) who reported that protection against malaria increased from 1.8% to 18.3% with introduction of ITNs, among African children living in malaria endemic countries, with 25% living in Nigeria. The results of this study show that 52.4% of males and 47.6% of females own ITNs in the study area. This result is lower than the 57.2% and 48.8% reported for males and females respectively as reported by (Garley *et al*., 2013). As expected, ITNs use was higher among females than males. This could be because of the high level of awareness among women about their low level of immunity during pregnancy, obtained during antenatal and post-natal visits, and on the importance of ITNs in malaria prevention and control (Cyrile *et al*., 2011).

The highest ITNs ownership was recorded among those age 20-44 years, while those age 5 - 9years recorded the highest ITNs hanging and use. This is closely related with the findings of (Siby *et al*., 2010) who found in their studies that 67% of people in their study were reportedly sleeping under ITNs and that 76.8% of children under five years also use ITNs. The implication is that there is some degree of awareness among mothers, in the study area, on measures in preventing infection with malaria, as well as other diseases of public health importance among children. Young adults of ages 5 -19 years had a decrease in ownership of ITNs. This is probably due to them passing on their ITNs to younger ones in the family (Eliningaya *et al*., 2011). The culture, tradition and personal believe of people or an individual within a population influences the acceptability and use of ITNs (Barbara *et al*., 2012). This is even more obvious among people of older ages within a population as they are usually uneducated and tend to be more inclined to their traditional and cultural believes (Ordinioha, 2012). In this study, the age group >60 years

had lowest percentage of ITNs possession, hanging and use.

The result shows that 37.1% of the mosquito nets in the study area were torn or damaged to some extent. This is relatively high damage to ITNs could be attributed to improper hanging of the nets, using sharp objects like nails, sun drying of the nets and exposing nets to open flames and hot objects as the holes were found to be at the lower parts of the nets within these communities. The number of ITNs that were without any damage was relatively higher than 40.4% obtained by (Gashawa, 2008) in Southern Ethiopia.

In conclusion, the findings of this research revealed that, there was low ownership of ITNs among the households in the Local Government, with a majority of them obtained from government health facilities. It can be concluded that the Local Government has not achieved goals set up by Roll Back Malaria and World Health Assembly of 100% coverage and 80% usage. To achieve equity between socio-economic status, distribution programs need to concentrate on targeting rural locations as opposed to easier to access urban areas. Government, health stakeholders and individuals should acquire and re-distribute ITNs and ITNs hanger kits free of charge. Public health education focusing on bed net use and maintenance should be incorporated into the programme of mass distribution of nets in the communities. This may be effective for improving durability and retention of insecticide on the ITN

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Ethics Approval and Consent to Participate

A written approval was obtained from the Commissioner of Health Taraba State Ministry of Health Jalingo and the Director Primary Health Care, Donga Local Government Area Taraba State. The community leaders were informed on the essence of the study and approval was given, consent was obtained from household heads before entering the houses, and the consent of individuals was obtained before participation.

Authors Contribution

Akogun, O.B and Mohammed, K conceptualized the study. Akogun, O.B, Mohammed, K and Agere H.J.I designed the study. Mohammed, K, **Agbo, O.J**, and Biyabra, M. I , participated in fieldwork and data collection. Akogun, O.B and Mohammed, K prepared the first draft of the manuscript, reviewed by Agere, H.J.I. All authors contributed to the development of the final manuscript and approved its submission

Disclosure of Conflict of Interest

There were not any conflicts of interest between the authors from beginning of the study to the end. Everything went well as design and agree on the proposal

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