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## Level of Knowledge among the Jaggery and Tea Workers on ITNs Use in Malaria Prevention in South Mugirango Sub - County, Kisii County, Kenya



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**Keywords:** Jaggery and tea workers, malaria transmission, ITNs.

### ABSTRACT

**Background:** Insecticide-treated nets (ITN) are the most powerful malaria control intervention tool, which has been recommended by most governments in the world if used correctly. Yet up to date, use is still very low in some places with only three percent of African sleeping under an ITN and about 20 percent sleeping under any kind of net. Worse still, malaria continues to be the leading cause of mortality and morbidity among the Jaggery and tea workers in the agricultural sector. Therefore, the main aim of this study was to establish the level of knowledge on ITNs use among the Jaggery and tea workers in the prevention of malaria in South Mugirango Sub County, Kisii County. **Methods:** The study adopted descriptive cross-sectional design whereby 209 Jaggery and tea workers were interviewed. Data were collected using questionnaires, key informant interview and focused group discussions. Qualitative data were transcribed; coded and categorized to come up with the emerging themes. Data were analyzed using SPSS version 20.0. Chi-Square was used to determine the relationship between variables. **Results:** The results show low levels of ITNs use due to lack of knowledge and low level of income, as (52.2%) did not know the difference between ITNs and non-treated nets. It was found that 56% of the workers were males with 44% females. Most of the Jaggery and tea workers were aged between 29-39 years and 40-50 years with 41% and 26% respectively. Education was significantly related ( $P < 0.001$ ) with ITNs use whereby 82.4% of non-users were found having no education at all. Gender and occupation were significantly related ( $P < 0.001$ ) and ( $P < 0.003$ ) with ITNs use respectively. Economic factors were also associated with ITNs use. The cost, accessibility and house structure were related ( $P < 0.010$ ) and ( $P < 0.001$ ) with ITNs use respectively. The study found that weather was significantly related ( $P < 0.001$ ) with ITNs use among the Jaggery and tea workers. **Conclusion and recommendations:** The study concludes that demographic and socioeconomic characteristics were statistically associated ( $P < 0.001$ ) with ITNs use. Low level of knowledge was found to influence ITNs to use among the Jaggery and tea workers. About 52.2% were unable to differentiate between treated nets from non-treated ones. This study, therefore, recommends implementation of programs and policy formulation to empower the Jaggery and tea workers in education and economically through income generating activities to strengthen their resource base. Study results are useful in addressing ITNs utilization among the Jaggery and tea workers in the prevention of malaria in Kisii County, Kenya. It will also help the Kisii County government to redirect more resources to malaria prevention.

## 1 INTRODUCTION

Globally the end of 2013, approximately half of the world's population was at risk of malaria transmission. Most of these malaria cases and deaths occurred in sub-Saharan Africa. However, Asia, Latin America, and to a lesser extent the Middle East and parts of Europe were also affected with specific risk groups as that with low immunity, immigrants workers and international travelers from non-endemic areas due to lack of immunity (WHO2013). Malaria is endemic throughout most of the tropics. More than three billion people worldwide are exposed yearly and over 240 million develop malaria (WHO2008).

From the year 2000 to 2010, the number of reported annual malaria cases in 34 malaria-eliminating countries decreased by 85 percent, from 1.5 million in the year 2000 to 232,000 in the year 2010 (WHO,2011).

The common species that causes malaria is *P. falciparum* that is spread by the female Anopheline mosquito, which bites between dusk and dawn (Filler et al, 2011).

Other rare mechanisms for transmission include: congenitally acquired disease, blood transfusion, sharing of contaminated needles and organ transplant But *P. vivax* and *P. knowlesi* can also cause severe disease. Malaria deaths peaked at 1.82 million in 2004 and fell to 1.24 million in 2010 (714,000 children <5 years and 524,000 individuals  $\geq 5$  years); over 80 percent of the deaths occur in sub-Saharan Africa (WHO, 2012; LANCET, 2012). Consistent use of ITNs can reduce malaria transmission by up to 90 percent (Gimming et al, 2008) and avert as much as 44 percent of all causes mortality (Lengeler, 2010). In Africa alone by 2012, there were about 207 million cases of malaria (with an uncertainty range of 135 million to 287 million) and an estimated 627 000 deaths (with an uncertainty range of 473 000 to 789 000). Malaria is caused by *Plasmodium* parasites. The parasites are spread to people through the bites of infected *Anopheles* mosquitoes, called "malaria vectors", which bite mainly between dusk and dawn. There are four parasite species that cause malaria in humans, *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, *Plasmodium falciparum* and *Plasmodium vivax* are the most common. Onwujekwe et al,(2003) in a Nigerian study also found that households with a recent attack of malaria were more likely to purchase a net than their counterparts. During the Abuja declaration (2000 RBM) one of the objectives and strategies, which was set by governments of the world and Kenya, included was to reduce malaria through the use of ITNs and other interventional measures. Africa accounts for the majority of estimated malaria cases (80%) and deaths

(90%), but only about 13% of the world's population. As a result, there has been a substantial increase in mosquito net coverage in African countries (UNICEF 2009). Recent data, however, indicate that effective programs have helped reduce newly reported cases by at least 75% in eight countries (WHO, 2013). A study done by Erhun, *et al* (2005) and Adedotun *et al* (2010) had shown that educated communities have multiple sources of information compared with their counterparts.

In Kenya malaria accounts for 30 percent of all outpatient cases and it causes high morbidity and mortality with negative effects on other sectors of the national economy as well for the Jaggery and tea workers (Oyediran & Achola, 2009).

Malaria is responsible for the majority of days lost due to ill health. More recently, environmental changes such as the El Nino phenomenon and changed rainfall patterns have added to the complicated malaria picture (Republic of Kenya 2010).

In 2012, over 9 million cases were reported with disease burden being highest in Nyanza and Western with 42 and 41 percent respectively with Nairobi and North Eastern having fewer cases of 5 percent and 4 percent (Republic of Kenya, 2012).

In malaria endemic areas it is revealed that there is one insecticide treated net to every five Kenyan due to stagnation of net ownership since 2007. Although the awareness level has improved over time, studies by (Osero *et al*, 2005, Adeneye *et al.*, 2007) have shown that many factors militate against actual ownership and correct use of ITNs.

The Government of Kenya spent 31 percent of its national budget with the estimated cost of ksh30.7 billion on 43 percent of its out-patient, while in 2011-2012 financial year Kshs10.1 billion was the national malaria control budget with 10.2 percent went to prevention and public health administration (Republic of Kenya, 2009). A study by Am strong-*et al* (2002) showed that re-treatment of nets by insecticides was effective if appropriately done to keep mosquitoes at bay for six months.

Kisii County is an area classified as highland, where there has been an upsurge of malaria cases in the past 20 years. Land in this region has been extensively fragmented due to population pressure, which has brought about important ecological changes affecting the malaria vector. These changes may have influenced the transmission rate of the malaria parasite leading to an increase in malaria prevalence in the community. High morbidity

reduces labor contribution to agricultural activities and ultimately agricultural output as patients cannot effectively contribute their labor to farm work (Nyamongo, 1998).

Alaii et al, (2003) and Osero et al, (2005) had found that many people who had nets were not using them. Therefore, the aim of this paper was to examine the level of knowledge among the Jaggery and tea workers on the ITNs use in the prevention of malaria in South Mugirango-Sub County, Kisii County, Kenya. This study will seek to bridge this literature gap and hence provide concrete information to spearhead the issues pertaining ITNs use. Knowledge gap on ITNs use will influence interventions aimed at decreasing malaria cases and increase ITNs use. Policy makers and program planners will utilize this information to develop policies that enhance ITNs use among the Jaggery and tea workers as well as mobilize the necessary and appropriately needed resources.

## **2 METHODOLOGY**

This was a community based descriptive cross-sectional study design. Both quantitative and qualitative data were gathered. The study area was South Mugirango Sub- County, Kisii County, Kenya, which was purposively selected and 209 both male and female Jaggery and tea workers were interviewed on the use of ITNs. Ten investigators to assess ITNs use administered questionnaires. The questionnaire was pretested by ten research assistants together with observation checklists.

The sample size was determined based on malaria prevalence in a study among in and outpatient in Kisii hospital, which was 14.5% .Study participant, was selected using systematic sampling from alist of tea growers and sugarcane growers. Desired sample size of 209 Jaggery and tea workers were obtained using predetermined intervals from the list.

Inclusion criteria were those Jaggery and tea workers aged 18-49 years were interviewed. The study excluded none response and those aged below 18 years. Quantitative data was collected via interviewer administered the structured questionnaire. Qualitative data was obtained by interview schedule from Focused Group Discussion. Key informant interviews were conducted and included tea and Jaggery field officer, public Health Officer and Administration officer-in-charge of the division and village heads. The questionnaire sought information on socio-demographic and knowledge on ITNs use in the prevention of malaria among the Jaggery and tea workers.

Data was collected and inspected, cleaned coded and then analyzed using SPSS Version 20 software with statistical significance set at  $p < 0.05$ . Descriptive statistical tests (mean and standard deviation) were used. Chi-Square test was used to establish the relationship between variables. Ethical considerations included seeking approval to carry out research from Kenyatta University Ethics Review Committee and permit from National Commission for Science, Technology, and Innovation (NACOSTI). Informed consent was obtained from the study participants. Confidentiality and privacy were guaranteed to the study participant and information were treated with utmost confidence throughout the session. The study also guaranteed autonomy and participants were engaged at their own free will and when uncomfortable during the course of study to withdraw at their own will.

### **3 RESULTS**

#### **3.1 Demographic and socio-economic characteristics of the Jaggery and tea workers**

209 Jaggery and tea workers consented to be interviewed and their data were included in the analysis (Table 4.1) details the demographic of the study population.

#### **3.2. Gender of the Jaggery and tea workers**

In this study (Table 4.1) it was found out that there were more males 116 (56%) than females workers 93 (44%) in both the Jaggery and tea industry.

#### **3.3. Age of the Jaggery and tea workers**

The mean age of the respondents was 34 years with (SD) = 6.2 years and ranged between 18 and 50 years. Most of the Jaggery and tea workers (Table 4.1) were between the ages 29-39 years at 85 (41%) while those aged between 18-28 years were 69 (33%) with 55 (26%) aged between 40-50 years.

#### **3.4 Marital status of the Jaggery and tea workers**

On marital status (Table 4.1) it was found out that 95 (45%) were married with 42 (20%) being single or living alone, while 29 (14%) were divorced with 23 (11%) being widowed and the rest 11 (5%) having no response with a few 9 (4%) living together without any formal arrangement.

### **3.5 Level of education of the Jaggery and tea workers**

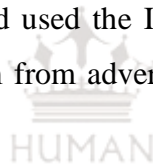
On the level of education (Table 4.1) the study revealed that 88 (42%) had the secondary education with 62 (30%) having had college education while 29 (14%) had the primary education with 16 (7%) having vocational while 14 (7%) had no education at all. This means that those without education were found to be the lowest users of ITNs.

### **3.6 Occupation of the Jaggery and tea workers**

This study revealed that more than half of the respondents (Table 4.1) 116 (56%) were tea workers while 87 (42%) were Jaggery workers with only six (2%) percent being engaged with other small-scale activities.

Most 74 of 116 (18%) of the tea workers were found using the ITNs in carrying tea to the tea buying centers and the reasons was said that nets and netting material were portable and easy to carry compared with the baskets.

It was also found out that 42 (20%) of the Jaggery workers cited the reasons for non-use of ITNs was that they worked at night and used the ITNs in making Jaggery shades with the remains from sugarcane to protect them from adverse conditions like rain and hot sunshine during working hours.



**Table 4.1 Characteristics of the Jaggery and tea worker**

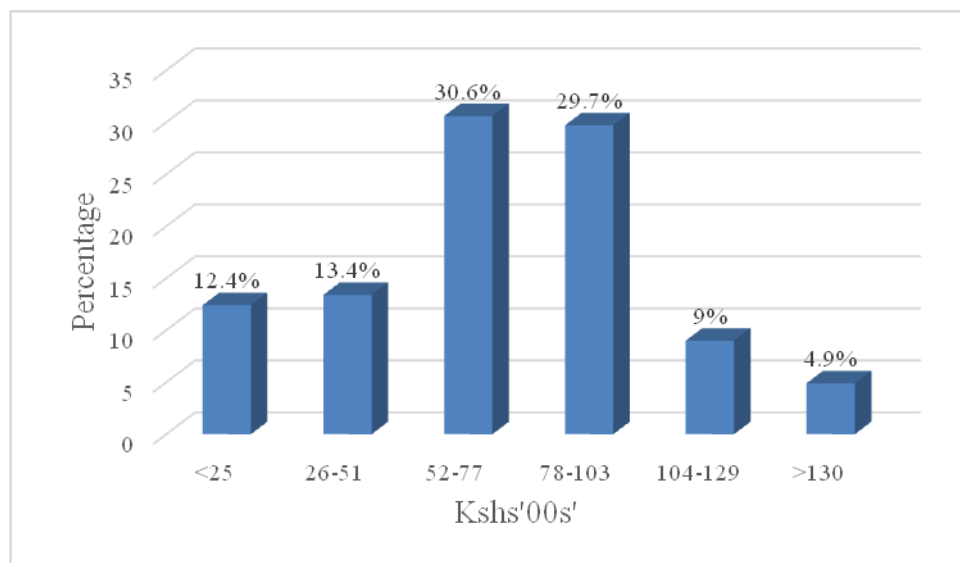
Variables	Frequency N	Percent
Gender		
Male	116	56
Female	93	44
Age		
18-28 years	69	33
29-39 years	85	41
40-50 years	55	26
Marital status		
Single	42	20
Married	95	45
Widowed	23	11
Divorced	29	14
Living together	9	4
No response	11	5
Education level		
None	14	7
Primary	29	14
Secondary	88	42
College	62	30
Vocational training	16	7
Occupation		
Jaggery worker	87	42
Tea worker	116	56
Others	6	2

The above (table 4.1) shows the characteristics of the Jaggery and tea workers. On gender, most of the respondents 116(56%) were male with 93(44%) being female. More of the Jaggery and tea workers age 85 (41%) ranged from 29-39 years. On marital status, it was found that 95(45%) were married while (42) 20 % were single. The study revealed that 88(42%) had the secondary education with only (62) 30 % had the college education. From their occupation, it was also revealed that most of the workers were engaged in tea farming while (87) 42 % were also sugarcane farmers.

#### 4.2.6 Level of income of the household

Almost all the households accessed some income (Figure4.1) below. Household income was found to be contributing factor to ITNs use among the Jaggery and tea workers. About 12.4% earned less than Kshs2500 while 13.4% earned Kshs2600-5100. Only 30.6% of the household

earned between Kshs5200-7700, (62)29.7%earned Kshs7800-10300, 19(9%) earned Kshs10400-12900, with 10(4.9%) earned more than Kshs13000.



**Figure 4.1: House hold income level of the Jaggery and tea workers**

The average income per household was Kshs77 ± 26.50. From FGDs it was revealed that workers in the Jaggery and tea industry earned very little to sustain them and have an extra to purchase ITNs.



**Table 4:2 Knowledge on treated and non-treated nets against ITNs use**

Variables	ITN Use		P-Value
	Yes n (%)	No n (%)	
<b>Treated and non- treated nets</b>			0.001
Yes	98(51.0%)	2(11.8%)	
No	94(49.0%)	15(88.2%)	
<b>Type of net</b>			0.044
Conical net	113(58.9%)	12(70.6%)	
Ordinary net	11(5.7%)	2(11.8%)	
ITNs	54(28.1%)	0(0.0%)	
None	14(7.3%)	3(17.6%)	
<b>Retreated nets</b>			0.315
Yes	51(26.6%)	3(17.6%)	
No	141(73.4%)	14(82.4%)	

Knowledge was measured on whether nets were treated or not, type of nets used and whether they had retreated. The respondent was asked from among the users whether they knew what ITNs were 98 (51%) mentioned that they knew what ITNs were and they said that they protect against mosquito bites while 15 (88.2%) of the non- users said they did not know what ITNs were.



58.9% of the users were able to identify the type of nets they were using. The majority 70.6% of non-users were unable to tell the type and the study revealed that 17.6% were found having none in their household. Among the users, 73.4% were found that they had not retreated their nets. A 32-year-old respondent said: "I work in the Jaggery industry the whole night. An ITN is useless for me because use long clothing at night to prevent me from mosquito bites."

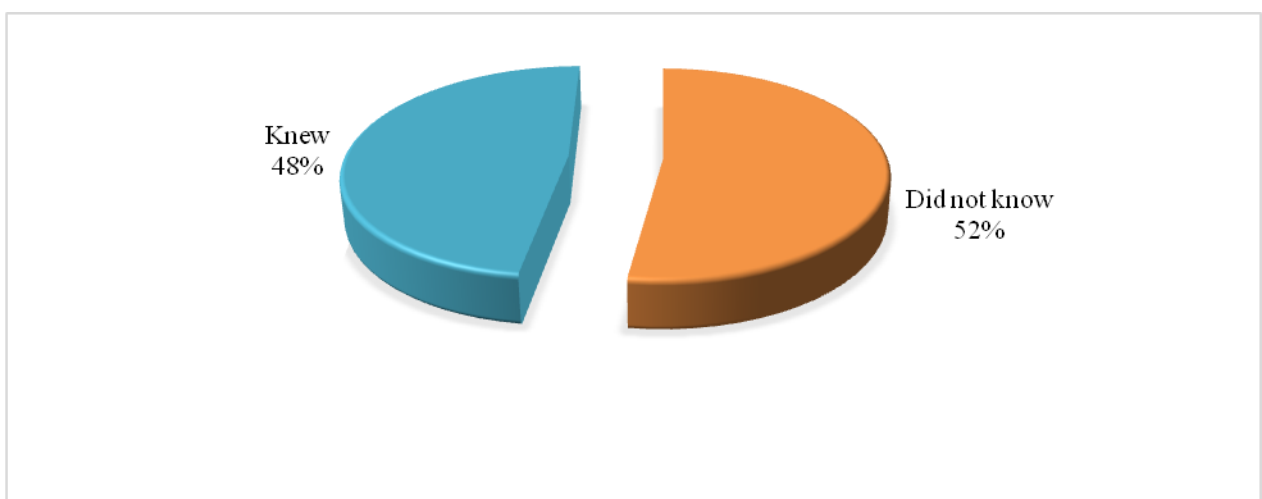
**Table 4.3 Knowledge about ITNs among the Jaggery and tea workers**

Variable	Frequency	Percent
Had knowledge	54	26
Had no knowledge	155	74
Total	209	100

The majority 74% did not have knowledge about ITNs among the Jaggery and tea workers. Also, those who knew ITNs said that these were the nets which had been treated or retreated with repellent chemicals that keep away mosquitoes from biting.

**4.3.1 Level of knowledge on treated and non- treated nets**

The majority 109 ( 52.2%) did not know the difference between treated and non- treated nets while 100 ( 47.8%) were able to differentiate between the two as they mentioned that new ITNs have a smell of chemicals and when used immediately opened make someone feel irritated, hence this could affect its utilization (Figure 4.2) below.



**Figure 4.2: The level of knowledge on treated and non- treated net**

#### 4.3.2 Number of mosquito nets in their places of residence

On the number of mosquito nets, 63(30%) had more than three nets, while 52(25%) had three nets with 36(17%) and 41(20%) having two and one net respectively in the target population (Table 4.4) below.

**Table 4.4 Number of mosquito nets in household**

Number of nets	Frequency	Percent
>Three	63	30
Three	52	25
Two	36	17
One	41	20
None	17	8

This study assessed the Jaggery and tea workers on the number of mosquito nets in their household. It was revealed that 30% of the respondent had more than three nets while 25% had three with 20% and 17% having one and two nets respectively. Only 8% had none in their households.



#### 4.3.3 Type of net used by Jaggery and tea workers in the house

The respondents were asked about the type of net used and they cited the following; conical net 59.5%, ordinary net 6.2%, ITNs 25.8%.and 8.1% had none can be seen in the(table 4.5) below.

**Table 4:5 Type of net used by the Jaggery and tea workers in the house**

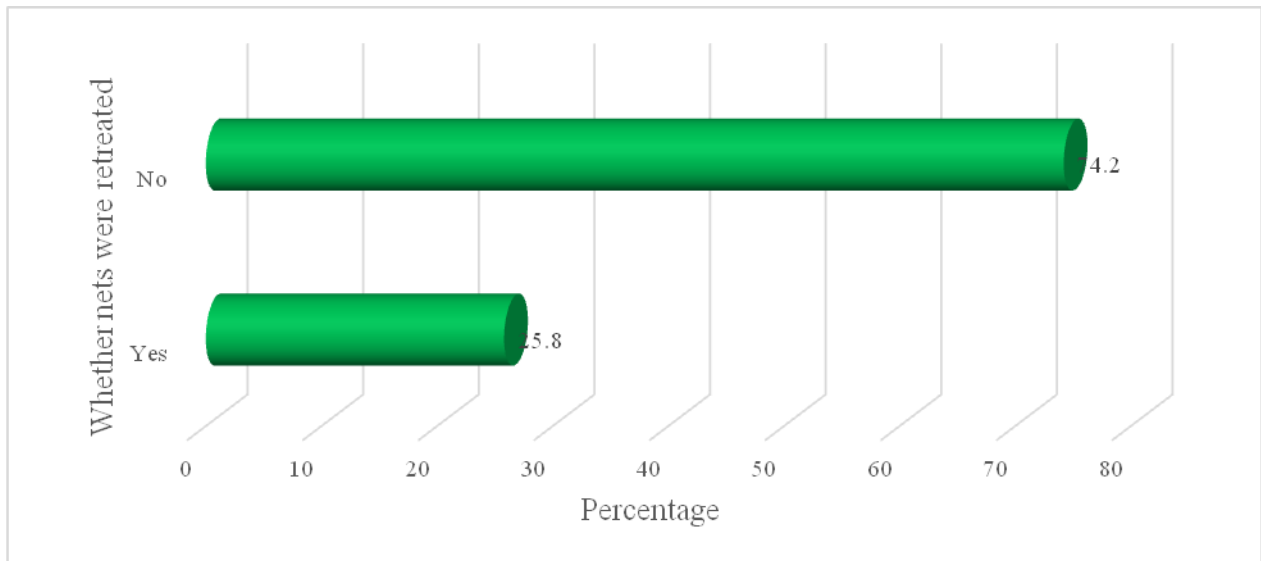
Type of net	Frequency N	Percent
Conical net	125	59.5
Ordinary net	13	6.2
ITNs	54	25.8
None	17	8.1
Total	209	100

The majority 59.5 % mentioned that they used conical kind of nets, as it was easy for them to hang with 25.8% having used ITNs, while 8.1% had none. Only 6.2%used ordinary nets of any kind, which were not treated. It was noted in this study that those who never used treated net both conical 125(59.5%), ordinary nets 13 (6.2%), and those 17 (8.1%) who had none

visited the hospital more than three times in the last six months having suffered from malaria episodes compared to those 54 (25.8%) who used ITNs the reason being that those nets were not able to repel the biting mosquitoes.

#### 4.3.4 Whether nets had been re-treated

The respondents were asked whether their nets had been retreated to establish their knowledge and awareness on the chemicals used, the length of time for retreatment and where they can be treated as illustrated in (Figure 4.3) below.



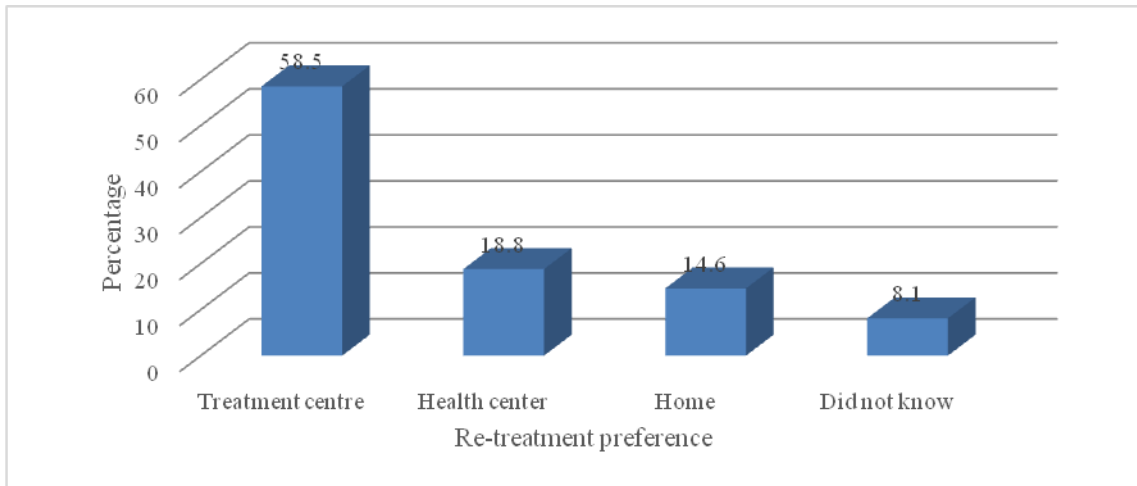
**Figure: 4.3 whether nets had been re-treated**

From this study, it was noted that 155 (74.2 %) of the respondents (Figure 4.3) cited that the net had not been re-treated while 54 (25.8%) said that the nets had been re-treated. Those 25.8percentage who re-treated their nets were aware and when to treat the nets compared to 74.2% who did not know even the type of chemicals used in the treatment.

One of the tea workers commented "I wish to receive the retreatment materials and to be shown how I can soak the net with insecticide and to know how it is done so that I can use the net consistently".

#### 4.3.5 Where they preferred to re-treat the nets

The respondents were asked where they would prefer to re-treat the net and the reasons for the preference. The results are illustrated in the (Figure4.3) below.



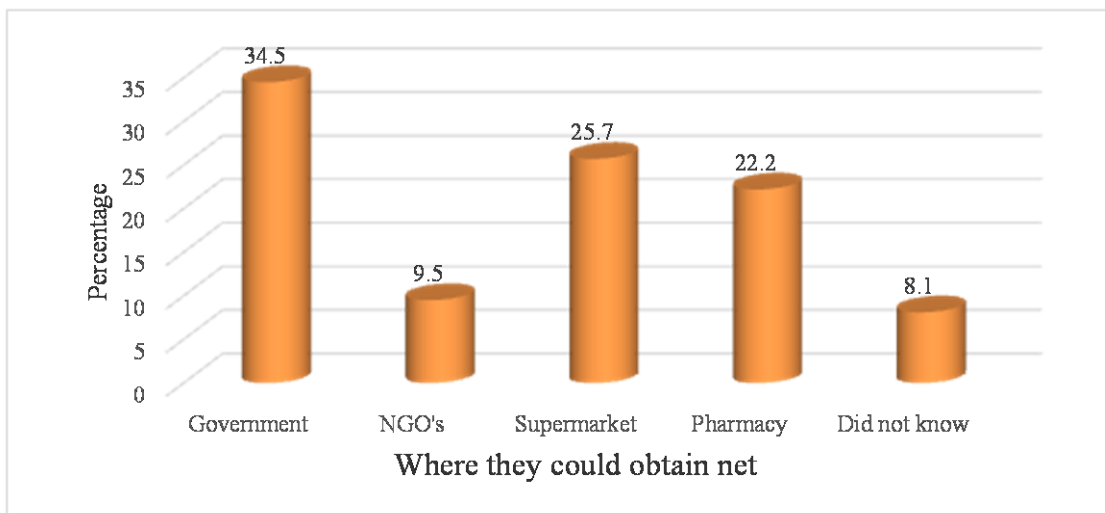
**Figure 4.4 Where they could prefer to re-treat the nets**

On where they would prefer to re-treat the nets 122 (58.5%) said treatment center with 39 (18.8%) said they would prefer to take them to the Health Centre. The reasons for preference was because they did not know the chemicals and how to use them. Only 12 (14.6%) said they could also prefer to do it from home and this was because they had knowledge of chemicals used and where they could purchase them from. A few 17 (8.1%) were not aware and the reasons being that they had none.



**4.3.6 Where the Jaggery and tea workers could obtain the nets**

On where they obtained net currently used, the respondents cited the following sources as seen from the (Figure 4.5) below.



**Figure 4.5 Where the Jaggery and tea workers could obtain nets**

Only 72(34.5%) of the respondent cited that they could obtain from the government, while 54 (25.7%) said the supermarket, as well as 46(22.2%), also said from the pharmacy and 20 (9.5%) said from the NGOs as presented in the above (Figure 4.4). From the information above it was clear that the respondent was aware of where they could obtain the net. This study also found out that 17 (8.1%) were not aware and they did not even have the nets in their households.

## **5 DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS**

### **5.1 Level of knowledge among the Jaggery and tea workers**

The respondent was asked whether they knew what ITNs were 155 (74%) mentioned that they knew what ITNs were they said that they protect against mosquito bites while 54 (26%) said they did not know what ITNs were. Those with knowledge about ITNs said that these were the nets, which have been treated or re-treated with repellants chemicals to expel mosquitoes. This study concurred with the one done by (Osero et al,2005, Adeneye et al,2007) which found out that although awareness level has improved over time there are other factors that militate against actual ownership and correct use of ITNs.

The majority 109(52.2%) did not know the difference between ITNs and non-treated nets while 100 (47.8%) (Figure 4.2) were able to differentiate between the two hence this could affect its utilization. Therefore, it was revealed that those who were unable to differentiate treated nets from non-treated nets were more likely not to have or used the ITNs in the prevention of malaria.

On the number of mosquito nets, 63(30%) had more than three, while 52(25%) had three nets with 36(17%) and 41(23%) having two and one net respectively in the target population. This study noted that those who had more than three nets were likely to hang for the visitors to use during the night than those who had less than two.

This study also assessed knowledge on the kind of nets used among the Jaggery and tea workers. The majority 59.5% mentioned that they used conical kind of net, as it was easy to hang with 25.8% percent having used ITNs while 6.2% said that they had used ordinary nets. It was noted in this study that 6.2% who used ordinary nets and netting materials visited hospital more than three times in the last six months having suffered from malaria episodes compared to 25.8% who used ITNs.

On whether nets had been re-treated by the Jaggery and tea workers, it was noted that 155 (74.2%) of the respondents (Figure 4.3) cited that the net had not been re-treated while 54 (25.8%) said that the nets had been re-treated. Those who re-treated their nets were aware and when to treat the ITNs compared to 74.2% who did not know. These findings correspond with a study by Am strong-majority owners did not do et al (2002) that showed that re-treatment of nets.

This study further to established where they could prefer to re-treat the net 122(58.5%) said treatment center with 39 (18.8%) preferred to take them to the health center. The reason for preference was that they did not know the chemical and how to use them. Of 12(14.6%) percent preferred to do it from home and this was because they had knowledge of chemicals used and where they can purchase it from. Only 17 (8.1%) did not have any preference as they were found not owning one.

This study also investigated where they could obtain the nets currently used in their households to establish their level of awareness. Only 71 (34.5%) of the respondent cited that they could be obtained from government, 54 (25.7%) Supermarket, 44 (22.2%) pharmacy, NGOs 20 (9.5%) as presented in the (Figure 4.4) above. Although they were aware, some 8.1% of the respondents were found not having any.

From the information above it was clear that the respondent was aware of where the ITNs could be obtained. Therefore, this study also concurred with a study done by Erhunj,et al (2005)and Adedotunet al (2010) which had shown that educated communities have multiple sources of information compared with their counterparts.

## 5.2 CONCLUSIONS

This study concludes that there was a relationship between knowledge and ITNs use among the Jaggery and tea workers with  $P < 0.001$ . Among the ITNs users, 49% were unable to differentiate between treated and non-treated net. Only 28.1 % of users had ITNs and therefore knowledge plays a role in the utilization of the net. The study also found that 73.4% of the users had not re-treated their nets. Therefore low level on the use of ITNs among the Jaggery and tea workers could have been attributed to demographic, socio-economic, and cultural factors as well as low level of knowledge, poor and inconvenient accommodation to hang the net. This study also found that there was an association between demographic and socio-economic characteristics and ITNs use among the Jaggery and tea workers.

The other factors within the households include the house structure, number of beds, number of people sleeping in the household, sleeping arrangements, number of nets within the household and number of visitors as the later led to the disruption of sleeping arrangements among the jaggery and tea workers. Effectiveness largely depends on the knowledge and perceptions of the people in the household who directly use them.

### 5.3 RECOMMENDATIONS

- Knowledge on ITNs among the Jaggery and tea workers should be enhanced.
- Health workers should be visiting the household level to establish their need to constantly remind on proper ITNs utilization.
- Massive sensitization and training to Jaggery and tea workers are necessary on ITNs. This, therefore, calls for an urgent and proper training on how to use the ITNs, the chemicals used for re-treatment and where it can be found.
- Both the public and the private sector should expand free ITNs to all the Jaggery and tea workers households.
- The poorest households should be empowered to have enough beds for all the Jaggery and tea workers this will lead to separation of beddings for visitors that led to the disruption of sleeping arrangements.
- Policy makers should take into account how malaria episodes among the Jaggery and tea workers affect the economy and measures to put in place to prevent malaria.

#### **Recommendations for further study**

The study suggests the following area for further research:-

- A study on the assessment of ITNs should be designed to have a wider coverage to bridge the gap for proper use.
- A study is required on how to improve ITNs utilization among the Jaggery and tea workers in the prevention of malaria.

### ACKNOWLEDGEMENT

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