ISSN No:-2456 – 2165

ADDIS ABBABA UNIVERSITY, SCHOOL OF PUBLIC HEALTH, EFETP

The RDT Prevalence and Risk Factors of Malaria Among Workers of Welkayt Sugar Factory, Tigray Region, Ethiopia –From, May - June /2014

Proposed Project Start Date - February 10, 2014

Proposed Project End Date - June 30, 2014

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August/07/2014

ACKNOWLEDGMENTS

At first and most I am very humble to say thank you to CDC, Mini –grant project for providing this great opportunity and their commitment on prevention and control of malaria in our region. I would also like to appreciate Mr.TEAME Zegeye (BSc, MPH), my Field Supervisor for his contribution on coordinating all activities to be done and Dr. Lucy Boulanger (MD, MPH) for her unreserved technical and administrative support, advice and motivation in achieving this output. I like to put across my great full appreciation to the organizations: Addis Ababa University, Federal Ministry of Health, CDC/Ethiopia, Ethiopian Public Health Association, Tigray Regional Health Bureau, District Health Offices, Health Centres and all other sectors who gave me all technical as well as financial support during my all residency time. At last but not least, my Acknowledgment also goes to Mr. Tesfay (Health coordinator of welkayt sugar factory) and to all my data collectors who contributed their efforts on achieving this research.

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ABBREVIATIONS /ACRONYMS

AAU	Addis Ababa University
EFETP	Ethiopian Field Epidemiology Training Program
AFNET	African Field epidemiology Network
CDC	Centers for Disease Control and prevention
RDT	Rapid Diagnostic Test
EPHA	Ethiopian Public Health Association
IRS	Indoor Residual Spray
IRB	Institutional Review Board
OR	Odds Ratio
SPH	School of Public Health
LLITNs	Long Lasting Insecticide Nets
WHO	World Health Organization
UNICEF	United Nations

EXECUTIVE SUMMARY

Introduction: Welkayt sugar factory has started working in June, 2013, found in western zone of Tigray region, Ethiopia .there are 7,249 permanent workers including 2,494 women and 4, 755 men. It is located at an altitude of 486 meter above sea level .The average annual temperature is 29.90c and there is 16.04mm of annual rain fall. Malaria remains a leading cause of death and ill-health in the developing world. According to the World Health Organization (WHO), there were more than 219 million cases of malaria in 2010, claiming 660,000 lives. At the welkayt sugar factory, malaria is one of the leading causes of morbidity throughout the year. The monthly prevalence of malaria was dramatically increased from 0.24 %(2) in July/2013, 4.7 %(38) in August/2013, 7.6 %(61) in September/2013 to 30.2 %(241) in October/2013. However, since the coverage of LLITN among the workers of the factory was reportedly nearly 100%, further investigation is needed to understand the unexpectedly high burden of malaria disease. This will be the first special epidemiological investigation study conducted in this area. The target of this study is to identify the incidence of malaria disease for respective parasite species and the risk factors for malaria disease among workers at the Welkayt sugar factory, Tigray region, Ethiopia.

Methods: The study was conducted among workers of welkayt sugar factory from may-June/2014 by using a cross-sectional study design and the area was stratified in to 11 stratums. We enrolled 470 participants by simple random sampling method from 4 of the total stratums that has been recruited by randomization. It was reviewed by local IRB and informed consent of the participants was applied. **Results:** The participation rate that have been enrolled to this study was 95.7 %(450 participants) out of this, the prevalence of malaria was 16 %(72cases) in which 52.7 %(38cases) were plasmodium falciparum, 44.4%932cases) plasmodium vivax and 2.7 %(2cases) mixed type of plasmodium parasite species. It was higher in Kalema working sites with 22.1 %(27cases).malaria has affected more males 69.5 %(50cases) than females 30.5 %(22cases). 94.4 %(425) of the total participants had a residency with smooth floors and plastered walls that may be considered as not safe for mosquito landing. the ITNs distribution rate was 59.8 %(269) in which 66.1%(178) were washing their ITNs when it gets dirty, 12.6%(34) 2-5 times a year, 5.57%(15) more than 6 times a year and the remaining 15.6%(42) had never washed their ITNs.However, the other 40.2%(181) of the total participants were not using ITNs in which 44.1%(80) were due to absence of ITNs in their home, 5.6%(9) had claiming that hanging ITNs over bed net influences for irritation, 7.7%(14) feels a suffocation and overcrowdings, 10.4%(19) had other different reasons where as the other 32.5%(59) had not responded us any reason not to use ITNs.

13.6 %(61) have been sprayed by insecticides (IRS), 7.8 %(35) were repellent users and 1.8 %(8) were taking a prophylaxis against to malaria infection. Eventhough most of the factors are not statistically significant, the workers can be prevented from malaria infection by 83% using ITNs (95%CI,AOR 0.83(0.47-1.47), by 33%(955CI,0.33(0.15-0.72) sleeping in indoor and by 50%(95%CI, 0.5(0.28-0.91) having a knowledge towards malaria .Inaddtion to this, they are more likely to develop malaria infection 2.4 times these who practice in irrigation (95%CI, 2.41(1.34-4.3)) and by 3.38 (95%CI, 3.38(1.85-6.18) times the workers involved in sugar cane cultivation.

Conclusions: we concurred that the place welkayt sugar factory face a significantly higher malaria infection because of the low application of prevention measures ranging from promotion of LLITNs to indoor residual spray (IRS) , environmental vector management and low community awareness towards prevention and control methods of malaria infection.

1. INTRODUCTION

1.1 Back Ground

Welkayt sugar factory has started working in June, 2013, found in western zone of Tigray region, Ethiopia.there are 7,249 permanent workers including 2,494 women and 4, 755 men. It is located at an altitude of 788 meter above sea level .The average annual temperature is 29.9^0c and there is 16.04mm of annual rain fall. . The factory is divided in to 11 sectors which are 3-5km distant from the health facility (clinic) that serves the entire factory where there are 21 health professionals, adequate water supplies and 24 hours of electric power service.

1.2 Statement of the Problem and Justification/Significance of the Study

Malaria is transmitted by the bite of the Anopheles mosquito which carries infective sporozoites stage in its salivary glands which it injects into the human blood stream during a blood meal. (1). There are about 400 different species of Anopheles mosquitoes, but only 30 of these are vectors of major importance (2). Malaria is caused by five species of parasites of the genus Plasmodium that affect humans (P. falciparum, P. vivax, P. ovale, P. malariae and P. Knowles). Malaria due to P. falciparum is the most deadly form and it predominates in Africa; P. vivax is less dangerous but more widespread, and the other three species are found much less frequently. (3)P. vivax has a wider distribution than P. falciparum because it is able to develop in the Anopheles mosquito vector at lower temperatures, and to survive at higher altitudes and in cooler climates. (2)

Transmission also depends on climatic conditions that may affect the abundance and survival of mosquitoes, such as rainfall patterns, temperature and humidity. In many places in Ethiopia, transmission is seasonal, with the peak during and just after the rainy season. (4)

It is seasonal in most parts of Ethiopia, with unstable transmission that lends itself to the outbreak of epidemics. The transmission patterns and intensity vary greatly due to the large diversity in altitude, rainfall, and population movement; areas below 2,000 meters (m) are considered to be malarious (or potentially malarious). Those areas are home to approximately 68% (52 million) of the Ethiopian population and cover almost 75% of the country‘s landmass. (5)

At the welkayt sugar factory, malaria is one of the leading causes of morbidity throughout the year. The monthly prevalence of malaria was dramatically increased from 0.24 %(2) in July/2013, 4.7 %(38) in August/2013, 7.6 %(61) in September/2013 to 30.2 %(241) in October/2013. However, since the coverage of LLITN among the workers of the factory was reportedly nearly 100%, further investigation is needed to understand the unexpectedly high burden of malaria disease. This will be the first special epidemiological investigation study conducted in this area. The target of this study is to identify the incidence of malaria disease for respective parasite species and the risk factors for malaria disease among workers at the Welkayt sugar factory, Tigray region, Ethiopia.

Overall, 68% of households in malaria-endemic areas (Ethiopia) were protected by at least one ITN and/or Indoor residual spraying of households with insecticides. It is believed that the vector control interventions have contributed greatly to a reduction in the burden of the disease. However, there is no a reduction in prevalence of malaria disease with high coverage of ITN among the workers of the factory .In addition to this, this area is mentioned under the malarious part of Ethiopia (<2000m above sea level) which needs a study. Because, there is no study conducted in this area before this. So that, the target of this study is to identify the prevalence of malaria disease with respect to their parasite species and the risk factors simultaneously associated with malaria in welkayt sugar factory, Tigray region, Ethiopia.

1.3 Literature Review

Globally, an estimated 3.4 billion people are at risk of malaria. WHO estimates that 207 million cases of malaria occurred globally in 2012 (uncertainty range 135–287 million) and 627 000 deaths (uncertainty range 473 000–789 000) .Most cases (80%) and deaths (90%) occurred in Africa and most deaths (77%) were in children under 5 years of age. In the Region of the Americas, reductions in incidence of >75% in microscopically confirmed malaria cases were reported in 13 out of 21 countries with ongoing transmission between 2000 and 2012. However, an increase in locally acquired cases, from 35 in 2000 to 59 in 2012, was reported from Algeria. (2) In 2012, 135 million people (4% of the global population at risk of malaria) were protected by IRS worldwide. In the African Region, the proportion of the population at risk that was protected rose from less than 5% in 2005 to 11% in 2010, but fell to 8% in 2012, with 58 million people benefiting from the intervention. The decrease in the number of people protected by IRS in Africa appears to be partly due to increased use of more costly non-pyrethroids insecticides (in response to the threat of insecticide resistance) in a setting of limited IRS budgets. The use of non-pyrethroids for IRS may become increasingly important as a

resistance management tool, because all currently approved LLINs are pyrethroids based. According to the global report 2013, the proportion of households in sub-Saharan Africa owning at least one ITN increased steadily, from 3% in 2000 to 56% (range 53%–60%) in 2012, with the most dramatic increase occurring during 2005–2010. The rate of increase in the estimated proportion of households owning at least one ITN has slowed recently; it decreased slightly, to 54% (range 49%–60%), in 2013. The decrease is probably related to the lower number of ITNs delivered to countries during 2011 and 2012, coupled with attrition of ITNs (due to loss and physical degradation), which reduces the supply of available nets. In 2013, the estimated proportion of the population with access to an ITN reached 42% (range 38%–47%) and the proportion sleeping under an ITN reached 36% (range 33%-41%). (3)

Clinical data have suggested an increased risk of malaria caused by proximity to urban agriculture, generally defined as irrigated farmland dedicated to commercial vegetable cultivation. Urban agriculture (UA) irrigation techniques in sub-Saharan Africa have inadvertently created new mosquito breeding grounds, 8 thereby increasing malaria risk in rapidly growing urban centers where anopheline vector densities were lower because of limited availability of suitable breeding sites (6).

According to Berrang-Ford et al. (2012), Health care professionals concurred that the place Batwa face a significantly higher malaria burden despite the application of prevention measures ranging from promotion of long lasting insecticidal nets (LLINS) to indoor residual spraying (IRS) and integrated vector management (IVM) (7). According to the Government of Uganda, low income households are also more exposed because poor quality housing is prone to mosquito entry and consequently, there are less means for preventive action (8). Further study has illustrated the increasing prevalence of malaria to be associated with warming temperatures and higher frequency of the disease in the local mosquito population (7).

According to MIS in Ethiopia, 2011, the results indicate that 55.2% of households have at least one mosquito net (of any type), and 54.8% of households have at least one long-lasting insecticidal net (LLIN). IRS had been conducted in 46.6% of households in the last 12 months preceding the survey.

Malaria parasite prevalence in areas <2,000m was 1.3% by microscopy blood-slide examination for all ages, with 1% of these being Plasmodium (P.) falciparum and 0.3% being P. vivax. Similarly, RDTs indicated the prevalence of infection to be 4.5% among all ages (9).

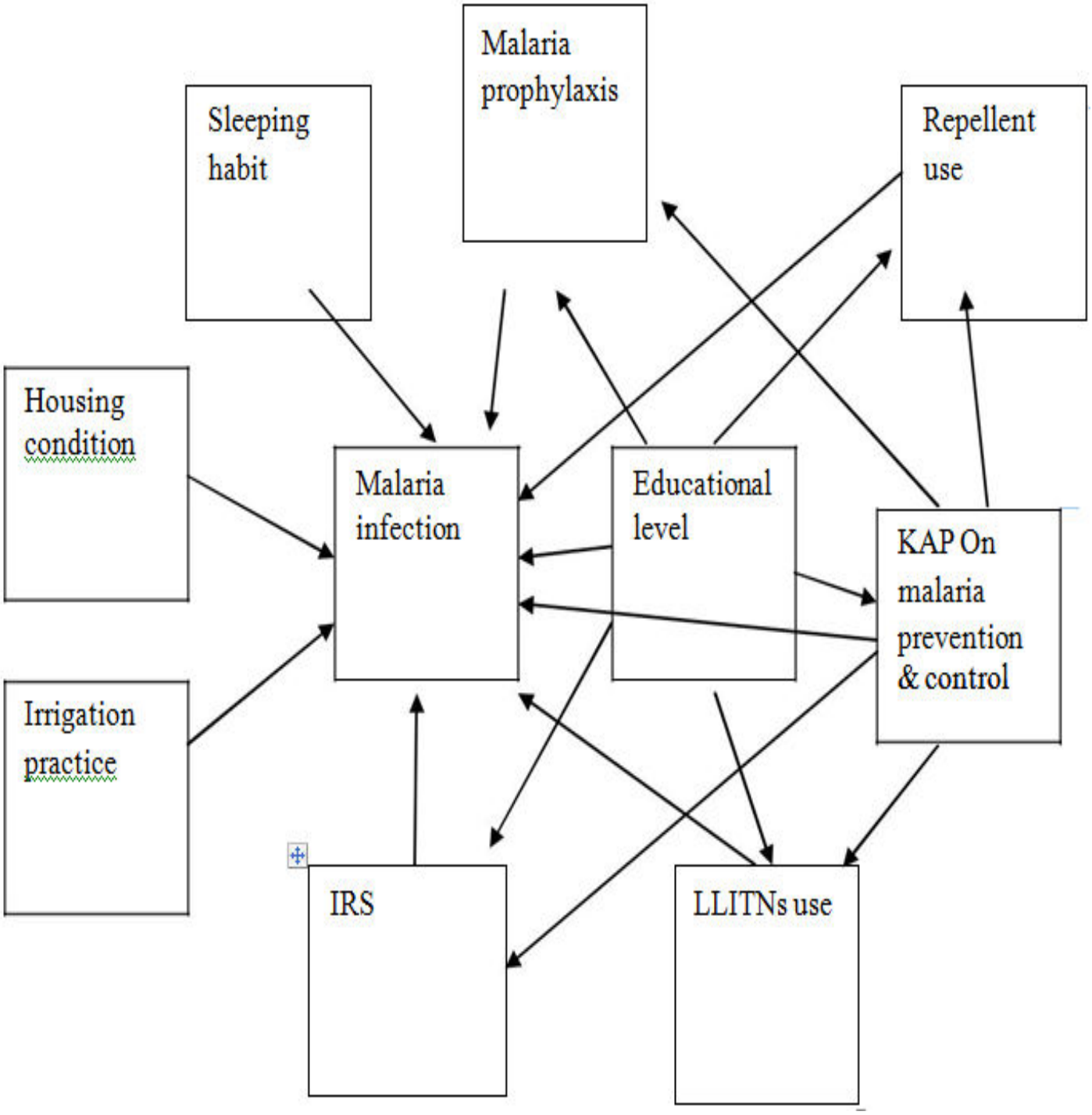
Overall P. falciparum prevalence was 14.5% (95% CI 12.7-16.3) in which 43.6% (95% CI 38.5-48.8) of children did not have a mosquito net, 50.6% (95% CI 45.4- 55.7) had an LLIN, 1.1% (95% CI 0.5-2.5) an insecticide-treated net and 4.7% (95% CI 3.1-7.0) an untreated net. Children in the younger age group (6 months-4 years) were more likely to sleep under an insecticide-treated mosquito net than children in the older age group (5-13 years) (10).

In Ethiopia, the overall prevalence of a positive blood slide (any species) was 4.1% (95% CI 3.4-4.9) in which it was varied greatly by region, being 4.6% (95% CI 3.8-5.6) in Amhara, 0.9% (95% CI 0.5-1.6) in Oromia and 5.4% (95% CI 3.4-8.5) in SNNPR .

The malaria species seen most frequently was P. falciparum: 52.2% of positive slides had P. falciparum only and 8.7% were mixed P. falciparum and P. vivax. Plasmodium vivax only was seen on 41.3% of the positive slides. The overall ratio of P. falciparum to P. vivax was 1.2 with zonal estimates ranging from 0.9 to 2.1. Overall 37.0% (95% CI 31.1-43.3) of households possessed at least one net; the maximum number of nets owned was 5 and the median was 0. Only 19.6% (95% CI 15.5-24.5) owned at least one LLIN. The mean number of nets of any type was 0.6 (95% CI 0.5-0.7) per house and of LLIN 0.3 (95% CI 0.2-0.4) per house (11).

In Afar region, study has shown 82.5% of the surveyed households had at least one LLIN hanging, and 71.9% had tucked the LLIN(s) under a mattress or other sleeping material (12).

1.4 Conceptual Frame Work



2. OBJECTIVES

2.1 General Objectives

- To identify the magnitude and the risk factors associated with malaria disease among the workers of Welkayt sugar factory , Tigray region, Ethiopia may-June/2014

2.2 Specific Objectives

- To describe the prevalence malaria with respect to plasmodium parasite species
- To assess the KAP of the workers on intervention activities against to malaria disease
- To identify the most prominent risk factors associated with malaria disease

3. METHODS

3.1 Study Area and Period

The study was conducted in Welkayt sugar factory from April-June/ 2014.This is located in western Tigray region, Ethiopia which consist a total of 7,249 permanent workers. It is 350km far away from Mekelle, capital city of Tigray region.

3.2 Study Design

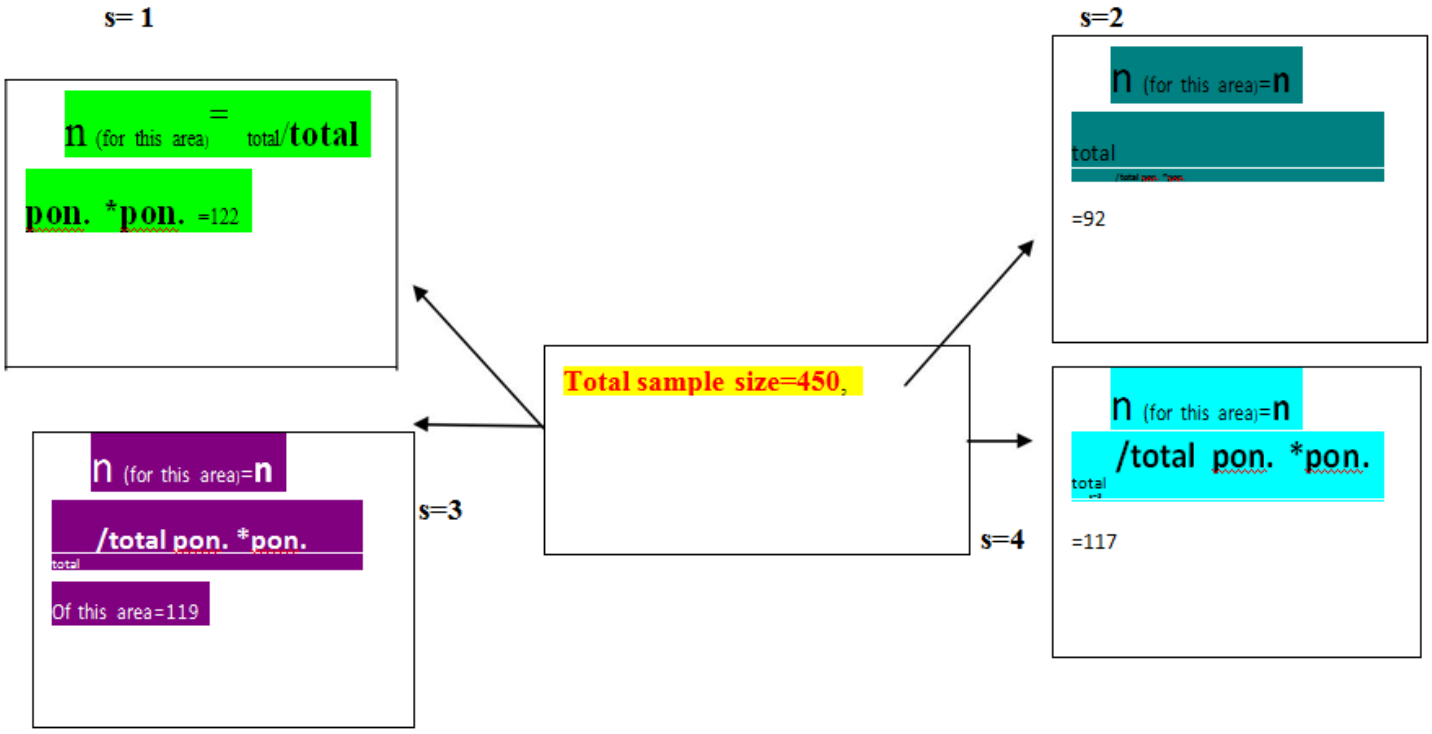
We used cross-sectional study to assess the prevalence of malaria using RDT. Consequently, the socio-demographic information, clinical features and risk factors was collected through their case status.

3.3 Sampling Procedure

we conducted using a multi stage sampling method; in which the factory has been stratified in to 11 strata according to their sector names and 4 of them were selected by simple random sampling method. In these selected strata, we recruited individuals by simple random sampling method for RDT prevalence. Consequently, the RDT positive (cases) and RDT negative without any febrile illness (controls) were assessed to identify the potential risk factors of malaria.

3.4 Sample Size

A total of 470 study subjects were designed to enroll but 450 were selected for the RDT prevalence study by considering a proportion (survey) sample size determination (i.e, population size=7,249, frequency expected (p) =20%, design effect=2 with 95%CI). Then from these study subjects, 72 cases and 378 controls were recruited which was computed by unmatched case control sample size determination from a previous study in other areas (OR=3, proportion of exposed controls =20%, power=80% with alpha=0.05).



N.B s= the sectors that have been stratified in to 4 strata.

3.5 Data collection tools and methods: we will assign data collectors and supervisors after having training on how to fill the data and checking data quality respectively. They will also stay for 8 days in the study area to perform their overall activities. They will have RDT stationary materials, a structured questionnaire that consists of a demographic information, clinical features, KAP and exposure of the risk factors. A blood specimen will be collected from individual study subjects for RDT .The data will be collected by reviewing the line listing data documented in the health facility and through household visits of both the controls and cases. The supervisors will monitor them in daily basis to check the data quality.

3.6 Data Entry and Analysis: Data will be entered by principal investigator using Epi Info ^{TM} version 7.0.9.7 .Data will be cleaned and then analyzed for descriptive statistics of the variables on interest and comparison of the risk factors. The statistical significance of the variables will be evaluated by computing through one way ANNOVA tests and further analytical tests using p-value of 0.05 which will be further discussed and interpreted. Finally, we will use a computer based MS-word for write up the research report.

3.7 Ethical Considerations: All the process will be started after Permissions is obtained from Addis Ababa University, school of public health. Support letter will be requested from the regional, zonal and health facility

officials before the data collection. During the data collection, all data collectors will be obliged to get informed consent of the respondent and all precautions will be taken to confidentially maintain patient‘s personal information.

3.8 Variable specification

Sr.no	Dependent variables	Independent variables
1	Illness due to Malaria	Sleeping without LLITN
2	Death due to malaria	Household without IRS
3		Stagnant water body near residence
4		Involved in cultivation of sugar cane
5		Sleeping outdoor
6		Migrating from malaria endemic areas
7		Low awareness on modes of malaria transmission
8		Unprotected water sources
9		Unsafe latrine utilization

3.9 Operational Definitions

- Daily laborer**:** the workers deployed in different working sites of the factory performing different types of activities such
- Technical staffs: those supervisors and engineers who monitor and order the daily laborers
- Knowledgeable: The participants who respond the correct answers >75%
- Positive Attitude: The participants who respond the correct answers >50%
- Positive practice: the participants who apply >50% of malaria prevention and control activities
- Malaria cases**:** these cases identified as having plasmodium species parasites in their blood using RDT

- Controls**:** these persons of RDT negative for malaria without any febrile illness disease who reside in the compound of the factory
- Household with IRS**:** these residencies sprayed with insecticides before six months
- LLITN users**:** these persons who respond sleeping under LLITNs every night

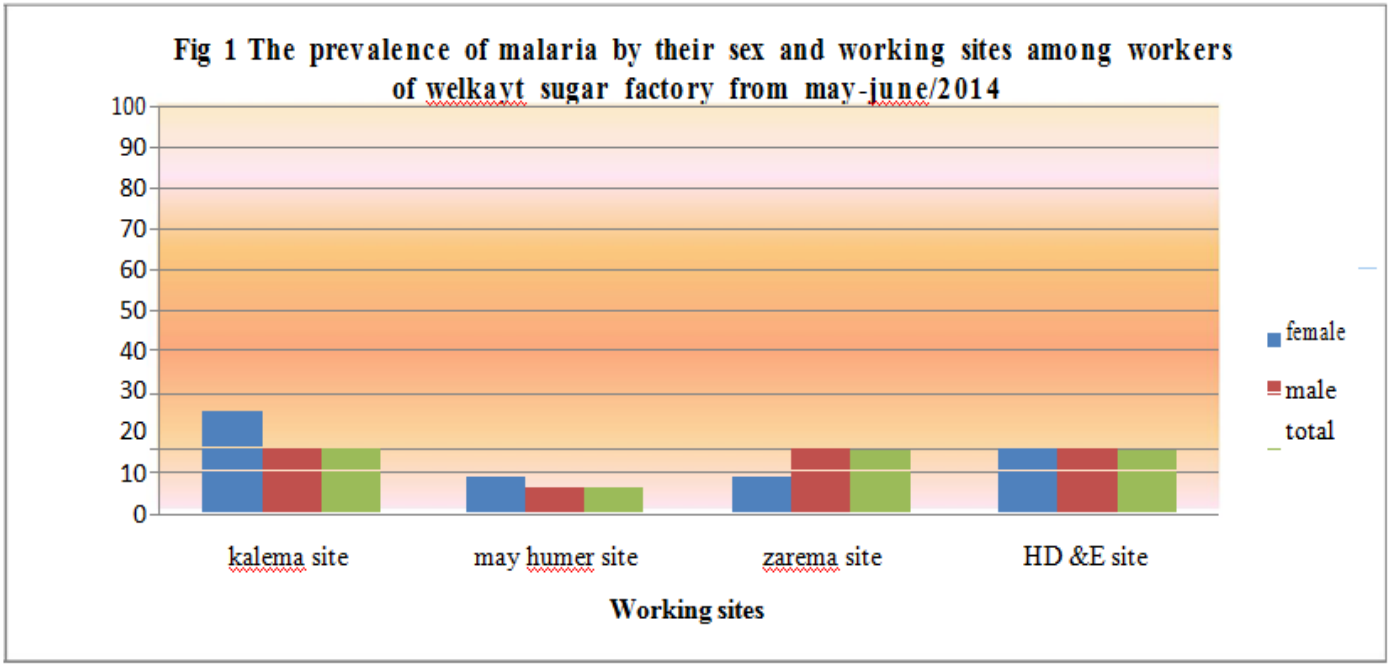
3.10 Result Dissemination Plan

Upon the completion of the final research, we submitted it to AFENET CDC trainee grants program and AAU, SPH, EFETP for review process at the end of July/2014. Consequently, a principal investigator will present the reviewed final research report to those organizations separately. As a result, we will request to EPHA for publishing this material. Finally, it will be disseminated to all health institutions according to their hierarchy (Tigray regional health bureau, welkayt woreda health office, health center of welkayt sugar factory) implement the interventions of controlling and preventing malaria disease based upon the findings.

4. RESULT

4.1 Descriptive Results

The participation rate that have been enrolled to this study was 95.7 %(450 participants) with 27.1 %(females) and 72.9 %(328) males. Among these total participants the prevalence of malaria was 16 %(72cases) in which 52.7 %(38cases) were plasmodium falciparum, 44.4%932cases) plasmodium vivax and 2.7 %(2cases) mixed type of plasmodium parasite species. The prevalence of malaria was higher in Kalema working sites with 22.1%(27cases) and it ranges from 6.7%(8cases)-19.6%(23cases) in the remaining three working sites .malaria has affected more males 69.5%(50cases) than females 30.5%(22cases).However, according to the stratification by their sex and residencies, females were highly affected than males in all working sites except Zarema working sites.



4.1.1Socio- Demographic Related Factors of Malaria Infection

Among the total 450 participants ,the prevalence of malaria was 1.3%(6cases) in less than 18 years age,13.6%(61cases) in 19-45 years age and 1.1%(5cases) in greater than 45 years age .consequently ,out of 72 total malaria cases ,age groups of 19-45 years(84.7%(61cases)) were more affected than the other age

category .however, in relative to their age distribution , the prevalence of malaria was higher in elder 35.7%(5cases) than the other. In addition to this, out of the total participants, 53.8 %(242) were students, 39.1 %(176) able to read and write and 32 %(144) elementary school students. As a result most of the participants were a single marital status that consisted of 61.8 %(278).consequently, the prevalence of malaria was mostly prominent in these students who are daily laborers with 7.1 %(32cases), in class of elementary school 6.9 %(31cases) and 8.7 %(39 cases) in single marital status.

Table 1.The socio- demographic of workers of welkayt sugar factory from may-June/2014

			Case %(no)	Control %(no)	Total%(no)
	Age group	<18	20.0%(6)	80.0%(24)	100.0%(30)
		19-45	15.0%(61)	85.0%(345)	100.0%(406)
		>45	35.7%(5)	64.3%(9)	100.0%(14)
		Total	16.0%(72)	84.0%3(78)	100.0%(450)
	occupation	Office work	12.9%(11)	87.1%(74)	100.0%(85)
		House keeping	7.1%(2)	92.9%(26)	100.0%(28)
		Technical staffs	28.4%(27)	71.6%(68)	100.0%(95)
		Daily laborers	13.2%(32)	86.8%2(10)	100.0%(242)
		total	16.0%(72)	84.0%(378)	100.0%(450)
	education	Illiterate	17.5%(17)	82.5%(80)	100.0%(97)
		Read and write	17.6%(31)	82.4%(145)	100.0%(176)
		Elementary	11.1%(16)	88.9%(128)	100.0%(144)
		Secondary and above	24.2%(8)	75.8%25	100.0%(33)
		total	16.0%(72)	84.0%(378)	100.0%(450)
	Marital status	single	14.0%(39)	86.0%(239)	100.0%(278)
		married	19.2%(28)	80.8%(118)	100.0%(146)
		other	19.2%(5)	80.8%(21)	100.0%(26)
		total	16.0%(72)	84.0%(378)	100.0%(450)

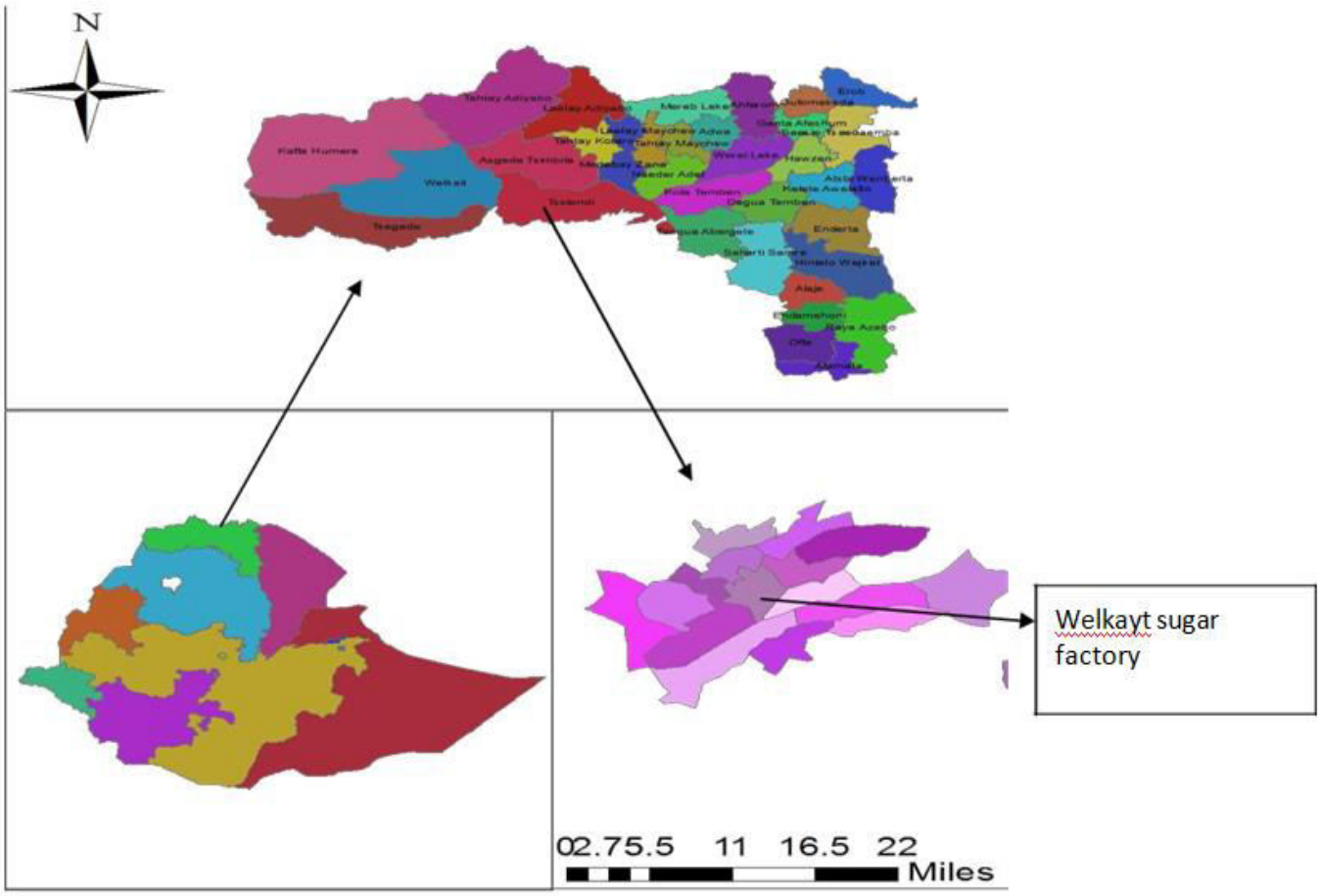
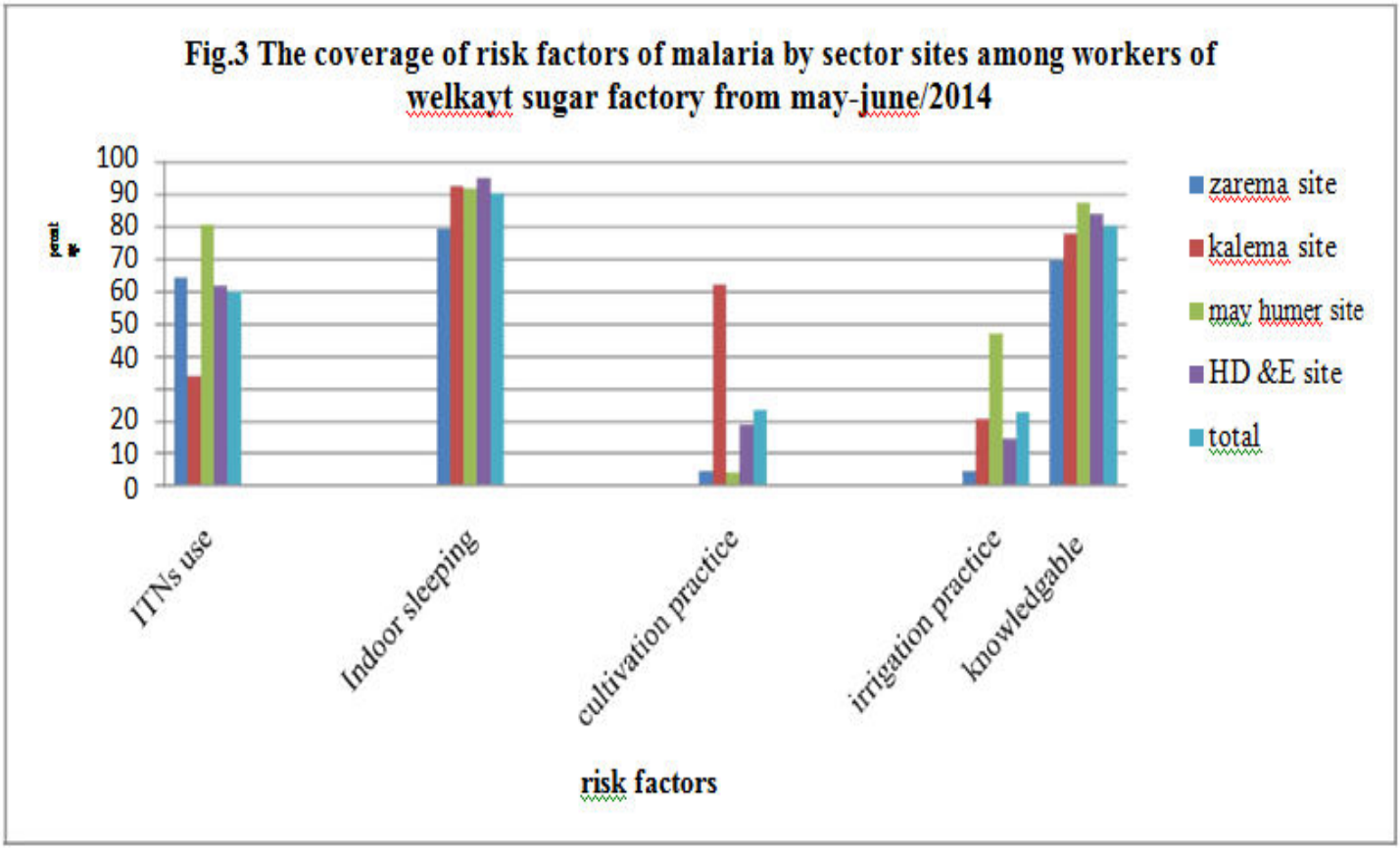


Fig 2 The Map of Ethiopia-Tigray Region –Tselemt District and Welkayt Kebelle ,2014

4.1.2 The Coverage of Risk Factors and Housing Conditions

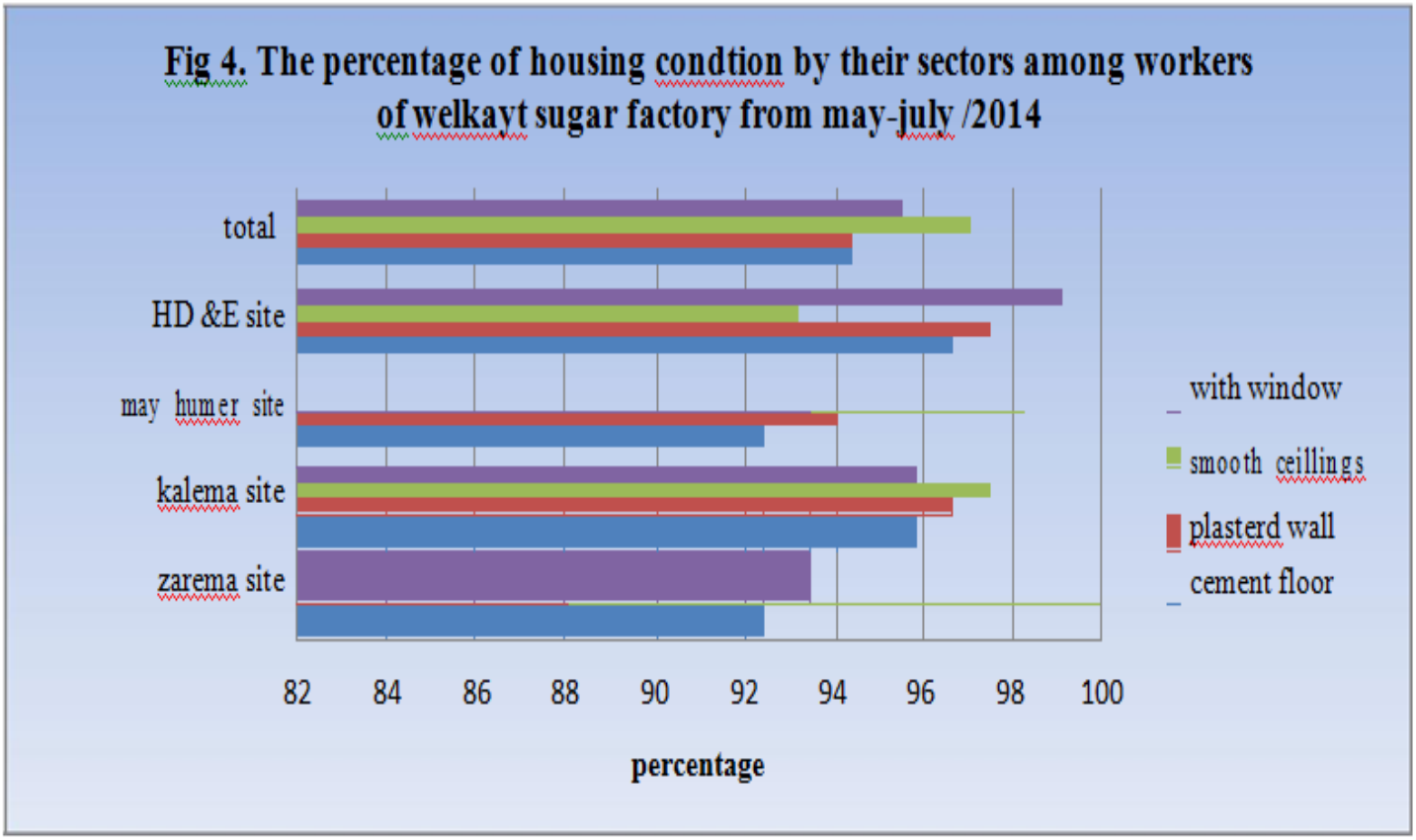
The distribution of ITNs and irrigation practice was higher in May-humer working sites with 80.7 %(96) and 47.1 %(56) respectively. Inaddtion to this, 23.1 %(104) of the total participants had a knowledge towards malaria prevention and control in this area. this was higher compared to the remaining working sites that ranges from 14.2%(64)-22%(99).Most of the time ,90.2%(406) of the total participants were sleeping in indoor which was similar in all specific working sites that resulted from 79.3%(73)-94.9%(112).

ISSN No:-2456 – 2165



Out of the total participants, 94.4 %(425) had a residency with smooth floors and plastered walls that may be considered as not safe for mosquito landing .This is also similar result to all working sites that ranges from 92.4%(85)-96.6%(114) and 88%(81)-97.5%(115) respectively for the above variables. Even, majority of the households of the participants were installed by corrugated iron with ―cornes‖ and windows .this has comprised of 97.1%(437).However, the smooth floor, plastered wall and presence of window were lower in Zarema working sites compared to the other. The main source of water supply was, 80.2 %(361) from tanker truck, 17.3 %(78) from bore hole and the other 2.5 %(11) were using from other sources. However, 57.8 %(260) of the total participants had practicing an open defecation.

ISSN No:-2456 – 2165



4.1.3 The Status of ITNs Conditions

According to the response of the participants, the ITNs distribution rate was 59.8 %(269) in which 77.7 %(209) were males and 22.3 %(60) were females. Out of these 269 ITNs users ,most of them , 66.1%(178) were washing their ITNs when it gets dirty, 12.6%(34) 2-5 times a year, 5.57%(15) more than 6 times a year and the remaining 15.6%(42) had never washed their ITNs. Most of the ITNs that have been distributed to the community had an age of less than 6 months with 42.3 %(114) where as 54.6% had 6months -3years age and 3 %(8) were unknown. Majority of these consisting 70 %(190) were delivered from work place which had a permanent brand name. Inaddtion to this, 84 %(226) of the total ITNs were in a safe condition which did not get dirty and had not any hole. However, the other 40.2%(181) of the total participants were not using ITNs in which, of these, 44.1%(80) were due to absence of ITNs in their home, 5.6%(9) had claiming that hanging ITNs over bed net influences for irritation, 7.7%(14) feels a suffocation and overcrowdings, 10.4%(19) had other different reasons where as the other 32.5%(59) had not responded us any reason not to use ITNs.

Table 2 The ITNs conditions among workers of welkayt sugar factory from may-June/2014

Sr.no	ITNs condition	Category	Cases (%)	Control (%)	Total (%)
1	Reasons not to use ITNs	Suffocation and no space	57.1%(8)	42.9%(6)	100.0%(14)
		Absence from home	15.0%(12)	85.0%(68)	100.0%(80)
		Irritation	55% (5)	45%.(4)	100%(9)
		Other reasons	31.6%(6)	68.4%(13)	100.0%(19)
		unknown	10.2%6	89.8%53	100.0%59
		total	20.4%(37)	79.6(144)	100(181)
2	ITNs washing	When it gets dirty	14.6%(26)	85.4%(152)	100.0%(178)
		2-5 times a year	14.7%(5)	83.3%(29)	100%(34)
		More than 6 times a year	6.7%(1)	93.3%(14)	100.0%(15)
		Never washed	14.2%(6)	83.8%(38)	100(42)
		Total	12.7%(35)	87.3%(234)	100.0%269
3	ITNs age	Within 6 months	7.9%(9)	92.1%(105)	100.0%(114)
		6 months-3 years	16.3%(24)	83.7%(123)	100.0%(147)
		Unknown	25%(2)	75%(6)	100%(8)
		total	5.5%(15)	94.5%(234)	100(269)
4	ITNs brand	permanent	12.8%(33)	87.2%(225)	100.0%(258)
		other	29.3%(3)	69.7%(8)	100%(11)
		Total	13.3%(36)	86.7%(233)	100%(269)
5	ITNs donor	Governmental health facility	3.2%(1)	96.8%(30)	100.0%(31)
		Health extension worker	5.0%(1)	95.0%(19)	100.0%(20)
		Retail shop	4.5%(1)	95.5%(21)	100.0%(22)
		Work place	15.8%(30)	84.2%(160)	100.0%(190)
		Other	33.3%(2)	66.7%(4)	100%(6)
6	ITNs quality	Good (no hole)	11.9%27	88.1%199	100.0%226
		Poor (1-4holes)	17.9%5	82.1%23	100.0%28
		Unknown	20%(3)	80%(12)	100%(15)
		total	13%(35)	87%(234)	100%(269)

4.2 Analytical Result

Out of 450 individual households of the participants, 13.6 %(61) have been sprayed by insecticides (IRS), 7.8 %(35) were repellent users and 1.8 %(8) were taking a prophylaxis against to malaria infection. in addition to this, 20 %(90) of the total participants had presented a swampy area in their residencies and 58.4 %(263) were observed a stagnant water. According to the indicators, we measured that 66 %(297) had a positive attitude towards malaria prevention and control methods but 29.1 %(131) of the total were involved in practice. However, all the factors discussed in the above were not statistically significant in a univariate analysis with 95% CI.

Table 3 A univariate analysis on risk factors of malaria in welkayt sugar factory from may-June/2014

Sr.no	Risk factors		Case (%)	Control (%)	Crude odds ratio(95%CI)	
1	Knowledge	<75%	49(13.6)	312(86.4)	.451(.25-.79)	0.005
	Knowledgeable	>75%	23(25.8)	66(74.2)		
2	Attitude	Positive attitude	46(15.5)	251(84.5)		0.68
		Negative attitude	26(17)	127(83)		
3	Practice	>50%	19(14.5)	112(85.5)	0.85(0.48-1.5)	0.57
		<50%	53(16.4)	266(83.6)		
4	IRS	Yes	11(18)	50(82)	1.18(0.58—2.4)	0.61
		No	61(15.7)	328(84.3)		
5	ITNs use	Yes	35(13.1)	233(86.9)	0.58(0.35-0.97)	0.039
		No	37(20.3)	145(39.7)		
6	Repellent use	Yes	9(25.7)	26(74.3)	1.93(0.86-4.3)	0.1
		No	63(15.3)	352(84.8)		
7	Prophylaxis use	Yes	0(0)	8(100)	1.19(1.14-1.2)	0.2
		No	72(16.3)	370(83.7)		
8	Swampy area	Yes	18(20)	72(80)	1.4(0.78-2.56)	0.247
		No	54(15)	306(85)		
9	Stagnant water	Yes	42(16)	221(84)	0.99(0.59-1.65)	0.98
		No	30(16)	157(84)		

10	Irrigation practice	Yes	24(23.5)	78(76.5)	1.92(1.11-3.3)	0.018
		No	48(13.8)	300(86.2)		
11	Cultivation practice	Yes	31(29.2)	75(70.8)	3(1.79-5.19)	0.0000
		No	41(11.9)	303(88.1)		

Eventhough most of the factors are not statistically significant, the workers can be prevented from malaria infection by 83% using ITNs (95%CI,AOR 0.83(0.47-1.47), by 33%(955CI,0.33(0.15-0.72) sleeping in indoor and by 50%(95%CI, 0.5(0.28-0.91) having a knowledge towards malaria .inaddtion to this, they are more likely to develop malaria infection 2.4 times these who practice in irrigation(95%CI, 2.41(1.34-4.3)) and by 3.38 (95%CI, 3.38(1.85-6.18)times the workers involved in sugar cane cultivation.

Table 4.A multi-variate analysis risk factors of malaria among workers of welkayt sugar factory from may-June/2014

Sr.no	List of risk factors	AOR(95%CI)	Chi-square (
1	ITNs use	0.83(0.47-1.47)	0.053
2	Sleeping habit(indoor/outdoor)	0.33(0.15-0.72)	0.005
3	Irrigation practice	2.41(1.34-4.3)	0.003
4	Cultivation practice	3.38(1.85-6.18)	0.000
5	Knowledge towards malaria	0.5(0.28-0.91)	0.025

5. LIMITATION OF THE STUDY

- Shortage of resource to confirm by microscopy blood-slide examination
- There was no network access for five days during data collection

6. DISCUSSIONS

Welkayt sugar factory is among the areas which are located in an altitudes with <2000m in which it is considered as malarious area .As a result the prevalence of malaria by RDTs was four folds compared to an MIS conducted in Ethiopia, 2011.However we haven‘t done a microscopy blood-slide examination to detect malaria infection in which it was 1.3% in Ethiopia since 2012. So that there might not be a discrepancy between in RDTs and microscopy blood-slide examination in welkayt sugar factory .Because the sensitivity and specifity of RDTs that we have been used in this study was the same to that of MIS in Ethiopia.

There had been a different prevalence of malaria infection among all working sites of welkayt sugar factory .This might be happened with unequal distribution of Long lasting insecticides nets (LLITNs), indoor residual spray and the difference in educational status despite the application of health education to all workers. In addition to this, males were highly infected than females which were not similar to the study of MIS in Ethiopia 2012. This could be due to males were most frequently enrolled to this study and they have been engaged mostly to malaria risk areas such as , cultivating of sugar cane and dam construction .

According to univariate analysis, malaria infection was not associated with the occupational status, marital status and educational status among workers of welkayt sugar factory from may-June/2014. However, malaria has affected more age groups of 19-45 years that did not meet with the study of WHO in 2012 Eventhough most of the workers were adults and the participation rate to this study was most frequent. The prevalence of malaria infection was also higher in those who were technical staffs and daily laborers because of the exposure in sugar cane farming land and irrigations and those who were elementary schools and able to read and write were also highly affected by malaria infection due to low awareness towards malaria prevention and control . Therefore these factors are a clue for malaria infection in welkayt sugar factory.

The housing conditions of the residents was safe in all working sites with an access of windows, plastered walls, smooth ceilings and cement floor except in zarema working sites. This might have been influenced for malaria infection not to be seen beyond a prevalence of 16 %(72cases) in welkayt sugar factory. Because, these factors are considered to be unsafe for mosquito landing and biting. However, the coverage of safe water supply and latrine utilization was very low compared to the national base line in Ethiopia this could lead to fetch water from pond and open defecation respectively. Consequently, the workers are going to be exposed to the areas where mosquito breeds.

In welkayt sugar factory, the distribution of LLITNs was 59.9%(269) which is in the range of to the study in sub-Saharan Africa 2012.But it was lower compared to the study conducted in Afar region in 2012 that were 82.5% of the surveyed households that had at least one LLITNs hanging. According to most of the respondent, they did not apply the standard rules of LLITNs washing rather they believe to wash their ITNs when it gets dirty. Deliberately, majority of the LLITNs were in a good condition with no holes, less than three years aged, and did not get dirty.

Inaddtion to this, some of the total participants were complaining an absence of LLITNS in the organization for use and they were feeling suffocation, irritation and overcrowdings not to use LLITNs The low distribution and acceptance of LLITNS has resulted for malaria infection to be higher among workers of welkayt sugar factory in 2014.

The coverage of insecticide residual spray (IRS) was lower than to the range of other studies like the study that have been conducted in sub-Saharan Africa 2012.

According to the multi vitiate analysis, LLITNs, sleeping habit in indoor and knowledge towards malaria prevention and control was the main associated factor to prevent from malaria infection. And also those workers who are participating in sugar cane cultivation area and irrigation are mainly at risk for malaria infection. Because, most of the workers were neither using repellents nor prophylaxis against malaria infection.

Generally, we concurred that the place welkayt sugar factory face a significantly higher malaria infection because of the low application of prevention measures ranging from promotion of LLITNs to indoor residual spray (IRS) , environmental vector management and low community awareness towards prevention and control methods of malaria infection.

7. RECOMMENDATIONS

- Tigray regional health bureau should supply LLITNs ,IRS ,repellents and prophylaxis
- The health worker of welkayt sugar factory should create a behavioral change of the workers on prevention and control of malaria infection
- The workers need to participate on environmental vector management
- The workers mostly assigned to sugar cane cultivation and irrigation should be prioritized to get repellents and prophylaxis
- The organization should facilitate in safe water supply and latrine utilization
- We highly encourage safe housing conditions of the workers

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ISSN No:-2456 – 2165

9. DATA COLLECTION TOOLS

Data collection tools for a research project proposal on the study of RDT prevalence and associated risk factors of malaria disease among workers of sugar factory, Tigray region from may-June/2013.

Name _____ Date of Data collection _____project Name_ _____

Case Status; case _____ control _____ID _____

1. Socio –Demographic

Sr.no	Question	Alternatives
1.1	Sex	1.Male 2.Female
1.2	Age	Years____ Month_____
1.3	Occupation	1. Office only 2. House 3. supervisor 4.student 5. Farming (in sugar cane) 6. Other
1.4	Educational level	1.Illitrate 2.Read & write 3. Elementary 4.Secondary 5. college and above
1.5	Marital status	1.single 2.Maried 3.Diverced 4.Widowed 5. Under age of 18
1.6	Number of family in house	

2. MEDICAL HISTORY (for cases only)

2.1	What were the signs and symptoms?	1.fever or fever with headache, 2. Rigor, 3.back pain, 4.chills, 5.sweats, 6. Myalgia, 7. nausea, 8.and vomiting
	RDT for plasmodium parasites	1.posetive 2.negative
	If positive, write the name of parasite	

2.2	For how many days were you ill?	
2.3	Did you take treatment?	1.Yes 2.No
2.4	Did you /he/she recovered after atment	1.cured 2.partially improved 3. Deteriorated 4. Death

3. RISK FACTORS

Sr.n	questions	response
3.1	Was your house sprayed in this year?	1.Yes 2.No
3.2	If yes, How many months ago sprayed?	
3.3	Does your household have mosquito nets?	1.Yes 2.No
3.4	If yes, how many?	
3.5	Did you sleep under this mosquito net last ht?	1.yes 2.No
3.6	If no, why don‘t use it?	1.No malaria 2.No nuisance 3.No space for net 4.Irritation 5.Suffocation 6.Difficult hanging net 7.Shape 8.Absence from home 9.Other 10.Don‘t know
3.7	How often do you wash your net(s)? (Don‘t read the response)	1,When it gets dirty 2.1 time a year 2 3.2 – 3 times a year 3 4.4 – 5 times a year 5.6 or more times a year
3.8	How long ago did your household obtain mosquito net?	1.whith in 6 months 2.6months-3 years nths ago 3.More than 3 years ago 4.unknown
3.9	What is Brand of Mosquito net?	1. Permanent 2. Olyset3. Safenit terceptor 5. Other/Don_t Know……
3.7	Where did you obtain the net	1.Governmental health facility 2.Health extension rker

		3.Community health worker 4.Retail shop
		5.Pharmacy 6.Work place 7.Other (Specify)_____ 8.Don‘t know
3.8	What is general condition of the net?	1Good(no holes) 2.Fair(no holes that fit a ch battery) 3,Poor (1-4 holes that fit a torch battery 4.Unsafe (>5 holes that fit a torch battery) 5.Unused (still in package) 6.Unknown
3.9	Have you ever used repellent against squito?	1.Yes 2.No
4.0	If yes, When?	1.every day 2.At night only(sleeping) 3.At work place 4.At day only(where ever)
4.1	Have you ever used prophylaxis?	1.yes 2.No
4.2	If yes, what type of drug?	
4.3	If yes, how often?	1.once a year 2.twice a year
4.4	What is main material of the floor?	1.Nutral floor 2.Ceramic 3.Cement 4.Carpet 5 .Dung 6.Earth/sand 7. Wood planks 8.others ecify)……
4.5	What is main material of the wall?	1.No walls Cane/trucks/bamboo/reed 3.Bamboo/wood with mud 4.Stone with mud 5. Carton 6. Cement 7. Bricks 8. Wood planks 9. Other
4.6	What is main material of the roof?	1.Thatch/Leaf 2 Sticks and mud 3. Rustic mat/plastic sheet 4.Wood 5.Corrugated iron

		Cement/concrete 7. Other pecify)……
4.7	Does your home have a window?	Yes 2.no
4.8	If yes, what type?	1.Windows with glass 2.Windows with screens
		3. Windows with curtains 4. Others (specify)……
4.9	If yes, when does it be opened?	1.day only 2.night only 3.day and night 4.never opened
5.0	Is there swampy area near to your idency?	1.Yes 2.No
5.1	Is there any stagnant water in your ality?	1.Yes 2.No
5.2	Had you practiced in irrigation?	1.Yes 2.No
5.3	Had you practiced in cultivating sugar ne?	1.Yes 2.No
5.4	Were you here three weeks ago?	1.Yes 2.No
5.5	If not, where have you been?	1.high land area 2.lowland area
5.6	What is the main source of drinking water members of your household	1.Piped water 2.Bore hole 3.Unprotected well 4.unprotected spring 5. Rain water 6. Tanker truck 7.Surface water 8.Irrigation channel
5.7	What kind of toilet facilities does your usehold use?	1. Flush/pour 2. Pit latrine with slab 3.Pit latrine Without slab 4.Ventilated proved latrine 5.Open pit 6.Open field
5.8	What is the monthly house hold income	
5.9	Where do you sleep most of the time?	1.indoor 2.outdoor

4. Assessment of Community KAP

Sr.no	Knowledge questions	response
6.0	Do you know mode of transmission of malaria?	1.Yes 2.No
6.1	Have you ever heard about prevention and ntrol of malaria?	1.Yes 2.No

6.2	If yes, where did you here?	1.health worker 2.TV 3.radio 4.family member 5.school
6.3	Do you know the most susceptible of malaria ease?	1.Yes 2.No
6.4	If yes, who are they?	1.<1years age 2.<5 years age 3.pregnant mothers 4.lactating mothers 5.all age groups
6.5	Do you know the breading sites of malaria ctor?	1.Yes 2.No
6.6	If yes, where?	1.swampy areas 2.jungle 3.stagnant water 4.other
	Attitude	Response
6.7	Do you think malaria can be prevented by ntrolling the vector?	1.Yes 2.No
6.8	Do you think malaria can be prevented by per environmental management?	1.Yes 2.No
6.9	Do you think prophylaxis can prevent malaria?	1.Yes 2.No
7.0	Do you think repellent can prevent malaria?	1.Yes 2.No
	practice	1.Yes 2.No
7.1	Do you sleep under LLITN every night?	1.Yes 2.No

7.2	Do you reside on a house hold sprayed by ecticides?	1.Yes 2.No
7.3	Do you participate on environmental nagement of your locality?	1.Yes 2.No