Addis Ababa University, Collage of Health Sciences, School of Public Health
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Compiled Body of Works in Field Epidemiology

by:

Faris Sulyman Mohammed (Bsc)

Submitted to the School of Graduate Studies of Addis Ababa University, College of Health Sciences, and School of Public Health in Partial Fulfillment of the Degree of Master of Public Health in Field Epidemiology.

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ADDIS ABABA UNIVERSITY
College of Health Sciences
SCHOOL OF PUBLIC HEALTH
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ADDIS ABABA UNIVERSITY

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List of abbreviations

AAU ----------Addis Ababa University

AFP ----------Acute Flaccid Paralysis

AIDS ----------Acquired immunodeficiency syndrome

ANC ----------Antenatal Care

AOR ----------Adjusted Odds Ratio

ART ----------Anti-Retroviral Therapy

ASCFR ----------Age Specific Case Fatality Rate

AUTRI ----------Acute Upper Respiratory Tract Infection

BCG ----------Bacille-Calmette-Guerin

BF ----------Blood Film

BSC ----------Bachelor of Science

CAR ----------Contraceptive Acceptance Rate

CFR ----------Case Fatality Rate

CHP ----------Community Health Profile

CHW ----------Community Health Workers

CI ----------Confidence Interval

COVID-19----------Coronavirus disease

CSA ----------Central Statistical Agencies

CTC ----------Cholera Treatment Center

DOT ----------Directly Observed Therapy

E.C ----------Ethiopian Calendar

EDHS ----------Ethiopian Demographic Health Survey

EFETP----------Ethiopian Field Epidemiology Training Program

EFY ----------Ethiopian Fiscal Year

eHMIS----------Electronic Health Management

eIDSR ----------Electronic Integrated Disease Surveillance Report

EMIS ----------Ethiopian Malaria Indicator Survey

EPHI ----------Ethiopian Public Health Instuite

EPRP ----------Emergency Preparedness Response Plan

EPI ----------Expanded Program on Immunization

EPTB ----------Extra pulmonary Tuberculosis

FMOH----------Federal Ministry Of Health

FP ----------Family planning

GC ----------Gregorian Calendar

GIS ----------Geographic Information System

GOV ----------Government

HAD ----------Health Development Army

HC ----------Health Center

HEWs ----------Health Extension Workers

HFs ----------Health Facilities

HHs ----------House Hold

HIT ----------Health Information Technology

HIV ----------Human Immunodeficiency Virus

HMIS ----------Health Information System

HP ----------Health Post

HRH ----------Human Resource Health

HSDP ----------Health Sector Development Plan

HWs ----------Health Workers

IDSR ----------Integrated Disease surveillance report

IHR 2005 ----------International Health Regulation

IRB ----------Institutional Review Board

IRS ----------Indoor Residual Spray

IS ----------Information System

ITNs ----------Insecticide Treated Nets

KM2 ----------Kilo Meter

LLITN----------Long Lasting Insecticide Treated Net

MCH ----------Maternal and Child Health

MD ----------Medical Doctor

MDR-TB ----------Multi-Drug Resistance Tuberculosis

MIS ----------Malaria Indicator Survey

NGO ----------Non-governmental Organization

OPD ----------Out Patient Department

OPV ----------Oral Polio Vaccine

OTP ----------Outreach Therapeutic Program

PBO ----------Pyrethroid–Piperonyl Butoxide

PCV ----------Pneumococcal Conjugative Vaccine

PF ----------Plasmodium Falciparum

PHEM -- ----------Public Health Emergency Management

PITC ----------Provider Initiated Test and counseling

PLWHA ----------People Living With HIV/ADS

PMTCT ----------Preventing Mather to Child Transmission

PNC ----------Post Natal Care

PV ----------Plasmodium Vivax

RDT ----------Cholera Rapid Diagnostic Test

RRT ----------Rapid Response Team

SAM ----------Severe Acute Malnutrition

SC ----------Establishing Center

SNNPR ----------Southern Nations Nationality People's Region

SPSS ----------Statistical Package for Social Science

SRS ----------Systematic Random Sampling

TB ----------Tuberculosis

TIC ----------Treatment Initiation Center

TT ----------Tetanus Toxoid

VCT ----------Voluntary Counseling Testing

WASH----------Water Sanitation and Hygiene

WHO ----------World Health Organization

Executive Summary

This comprehensive collection comprises eight main chapters, all generated during the program's residency period. These sections represent the anticipated outputs for the residency, including investigations of outbreaks, analyses of surveillance data, evaluations of surveillance systems, health profile reports, manuscripts intended for peer-reviewed journals, abstracts for scientific conferences, thesis reports, and various other contributions.

Chapter One: An outbreak investigation was conducted in Soro Woreda, located in the Hadiya Zone of the Central Ethiopia Region. This area reported a total of 101 cases of cholera, with three resulting in fatalities. The outbreaks were confirmed by the national reference laboratory of EPHI, and a descriptive analysis was performed. Recommendations were made based on the findings.

Chapter Two: The field epidemiology training programs another core competency is doing surveillance data analyses. To summarize malaria epidemiology in the Silte Zone Health Department, we retrospectively evaluated the five-year national malaria surveillance data obtained between 2018 and 2024.

Chapter Three: In Hulbareg Woreda, the malaria disease surveillance system was assessed from March 11 to March 22, 2023, using a descriptive cross-sectional study design. This chapter provides a comprehensive overview of the goals and objectives of malaria surveillance, detailing the advancements made toward achieving these targets. Additionally, it evaluates the surveillance system on various criteria, including simplicity, flexibility, acceptance, representativeness, timeliness, data quality, sensitivity, cost, predictive value, positive predictive value, and overall utility.

Chapter Four: A health profile serves as a tool for gathering and summarizing health and health-related events, along with demographic, socioeconomic, political, and cultural information about a particular district. "Data on health and related factors were gathered in Hulbareg Woreda, located in the Silte Zone, from January 16 to February 15, 2023."

Chapter Five: I have attached two manuscripts intended for a peer-reviewed journal. The articles included an investigation of retrospective malaria data reports and my thesis.

Chapter Six: Abstracts on "malaria data analysis in Hulbarage Woreda of the Southern Nations Nationality People's Region “and "health profile description" have been presented. These abstracts were formulated during the duration of this residency.

Chapter Seven: A study titled "Assessment of insecticide-treated bed net utilization by pregnant women in rural Kebeles of Hulbarage Woreda, Southern Nation Nationalities Region" was carried out. Malaria is common in Hulbareg Woreda, although there is a lack of information on the level of ITN use among pregnant women. This study aimed to analyze the utilization level of insecticide-treated bed nets among pregnant women in Hulbareg Woreda, which is located in Southern Nations Nationality People's Region. A mixed-methods community-based cross-sectional study was conducted in Hulbareg Woreda from January 2 to February 29, 2024.

Chapter Eight: Contain additional output, like a weekly epidemiological bulletin.

Chapter I: Outbreak Investigation Reports

1. **An examination of the descriptive epidemiology related to the cholera outbreak in the Hadiya Zone, situated in the Central Region of Ethiopia, in 2023.**

Abstract

Introduction: Cholera is a diarrheal illness caused by the gram-negative bacterium Vibrio cholera. It is marked by severe watery diarrhea, which can rapidly result in dehydration and death if left untreated. In June 2023, an unusual increase in cases of watery diarrhea was reported in Soro Woreda, Hadiya Zone.

Methods: Between September 1 and October 30, 2023, a descriptive analysis was conducted on the line list of 101 cholera patients. We defined cases, selected study participants, and performed descriptive analysis. We analyzed data in Microsoft Excel 2010, calculating and describing frequency, percentage, mean and median; attack rate (AR), and case fatality rate.

Results: The line list showed 101 cases and three deaths, with a CFR of 2.9%. Of the cases, 44 (43.5%) were male, while 57 (56.4%) were female. The age-specific case fatality rate was highest among those aged 15 to 44 which was 43 (43.6). The kebele with the most reported cases was Oda 46 (45.5%). The outbreak began on July 7th and continued until December 30th, 2023. Of the overall cases, 66 (66.3%) were seriously dehydrated.

Conclusion: Cholera epidemic with a higher overall attack and case fatality rate was confirmed. Females were more affected than males, and the majority of those affected were above the age of fifteen. We advocate preventing future outbreaks, implementing response measures to reduce morbidity and mortality, and developing future cholera prevention policies for the Zone.

Key words: cholera outbreak, descriptive epidemiology, Soro woreda, Hadiya Zone.

1.1. Introduction

1.1.1. Background

Cholera is a waterborne bacterial pathogen that causes symptomatic cholera, characterized by severe watery diarrhea and rapid onset of dehydration (1). Cholera is typically presented with watery diarrhea, which may or may not be accompanied by vomiting, and can lead to severe dehydration, potentially resulting in death if not treated (2). The illness may begin suddenly with severe watery diarrhea, or it can present with initial symptoms like loss of appetite, abdominal discomfort, and mild diarrhea. Vomiting frequently occurs a few hours after diarrhea starts (3).

It is estimated that nearly 1.3 billion Persons in endemic countries face the risk of cholera globally, leading to approximately 2.86, 000,000 illnesses and 95,000 fatalities each year (4). Sub-Saharan Africa accounts for 60 percent of these instances. In Ethiopia, over 70 million individuals are considered at risk, resulting in an average 275,221 infection and 10,458 deaths each year, corresponding to a prevalence of 4 infection per 1,000 people (3).

Recognizing the risk factors linked to cholera outbreaks helps identify community practices that increase exposure to cholera infection, enabling the development of effective behavior change interventions. Previous research has identified several common associative factors for cholera outbreaks worldwide, including polluted water sources, unclean raw vegetables, insufficient latrine facilities, and sever rains and flooding (3). While comprehensive studies to identify nationwide associative factors for cholera outbreaks in Ethiopia have not been carried out, some limited research has identified various associative factors. These include unsanitary latrines, contact with cholera patients, and move to areas experiencing cholera outbreaks (3), and poor hygiene and non-availability of clean water (3).

Untreated cases can cause high CFRs, but prompt rehydration therapy can reduce them to 1%.(2). The global estimates for cholera cases and deaths are about 2.9 million and 95,000 per year, respectively (2). Effective long-term multi-sectorial control and prevention strategies are crucial for reducing cholera morbidity and mortality in both endemic and epidemic settings. These strategies should ensure adequate access to water and sanitation, promote health and hygiene through social mobilization, support immunization efforts, enhance surveillance, and enable prompt and appropriate case management (5). As of January 3, Haiti's case-based surveillance system had identified 20,262 suspected cases, with 1,332 (7%) confirmed through culture tests.

A total of 16,019 (79%) of these patients were hospitalized. Among the identified a patient with probable cholera, 11,580 (6). Of the suspected cholera cases, 57% are males, with a median age of 21 years (between ages less than 1 to 100 years). About one 36% of the patients are under 10 years old. The highest percentages of probable cholera infections (20%) and fatalities (17%) were among children aged 1 to 4 years, accounting for 4,009 cases and 48 fatalities, respectively (6). Cholera outbreaks study carried out in Addis Ababa, focusing on an etiology, origin, associative factors, and control. Untreated cases can cause high CFRs, but prompt rehydration therapy can reduce them to 1% (7).

Vibrio Cholera is an abrupt diarrheal disease caused by toxigenic V. cholera. It can lead to death within hours if untreated, but when properly managed, the case fatality rate is below <1% (8). Several nations still to report greater case fatality rate (CFR) than in prior years. The mean vibrio cholera CFR reported worldwide in 2021 was 1.9 percent (2.9 percent in Africa), a large increase above the targeted rate <1% and the largest report in more than decade (9). research suggesting that each year an estimated 1.34 million cases and 21,000-143,000 deaths occur worldwide due to choler (10).

In Ethiopia, vibrio cholera has affected many regions of the country many times throughout history. Although well-recorded evidence is scarce, some historical accounts of the 18th century show the disease was brought into the country through traders and travelers (10). In the 19th and early 20th centuries, literature suggested that there were five major epidemics of the disease, which totally resulted in tens and thousands of deaths, with this period also marking the southward spread of the disease (10). In the 1990s, after several years of absence, cholera emerged in 1993. This outbreak started in Dire Dawa city, and in subsequent months, cases were also reported from the Oromia and Somali regions and in the city of Addis Ababa. Overall, studies suggest the attack rate for this outbreak was around 2–15 per 1000 with an average case-fatality rate of 2.5% (10).

In Ethiopia generally the main identified risk factor of cholera is contaminated water sources and low sanitation coverage that implies the national sanitation coverage in Ethiopia is 57 % which translates to more than 45 million people without access to improved sanitation facilities(11). Over the past two decades, Ethiopia has made significant strides in healthcare, clean water, maternal and child health, and developed a National Health Adaptation Plan to Climate Change, but cholera remains a significant public health threat (10).

Between 2015 and 2023, the country experienced multiple outbreaks, with 2015 causing over 26,000 cases and 217 deaths, and 2017 resulting in over 48,000 cases and 878 deaths (10). The distribution of the outbreak by place is different from year to year, although some areas saw repeated outbreaks (10). In 2017, the Somali region was the most affected, accounting for approximately 75% of all reported cases and 87% of total deaths nationwide. During that year, population movements related to religious pilgrimages to sacred sites and seasonal labor migration for work on commercial farms and mines significantly contributed to the resurgence of outbreaks in the Afar, Amhara, and Tigray regions (10).

In 2022, cholera outbreaks happened in the south-eastern part of the country in Bale zone (Oromia Region) and Liban Zone (Somali Region) (10). A total of 674 cases and 7 deaths with AR per 100,000 population of 201.73 and CFR of 1.04%(10). Currently, more than 15.9 million Ethiopians (about 15% of the total population) live in Woredas that have been repeatedly and significantly affected by cholera outbreaks, putting them at high risk for future incidents. The Global Roadmap to 2030 aims to reduce cholera-related mortality by 90% by that year, requiring strong commitment from all stakeholders involved (10).

1.2. Significance of the Study

Cholera is a significant public health concern that is regularly monitored at both national and international levels as an immediately reportable disease under the International Health Regulation (IHR 2005). Any suspected cholera cases must be promptly reported to the relevant public health emergency management (PHEM) department.

Even though a cholera outbreak has occurred in several parts of Ethiopia including Central Ethiopia, there were no any registered case of cholera within the last six month times (June – December 2020) in Kembata Zone Yem Special Woreda. Nevertheless, we received suspected cases in July 2023 from Silti Woreda of Silte Zone, Abeshga Woreda of Gurage Zone, Werra Woreda of Halaba Zone and Hadiya zone. Following a request for support from the PHEM process owners, a multidisciplinary team was deployed to Hadiya Zone in response to the cholera outbreak. The purpose of this study was to characterize the geographic distribution of cholera case where individuals contract the disease.

2. Objective

2.1. General objective

To describe the distribution, morbidity, and mortality associated with cholera outbreaks, as well as the control measures implemented in Hadiya Zone, Central Regional State, Ethiopia, in 2023.

2.2. Specific objective

- ✓ To describe the morbidity and mortality of cholera outbreak in Hadiya Zone, Central Ethiopia Region, Ethiopia.
- ✓ To describe outbreak by person, place and time perspective at Hadiya Zone, Central Ethiopia Region, Ethiopia.
- ✓ To describe the strategies of the outbreak response and constraints implemented in Hadiya Zone, Central Ethiopia Region, Ethiopia.

3. Methods and Materials

3.1. Study Area

Soro is a woreda located in Ethiopia's Southern Nations, Nationalities, Ethnicities, and Peoples Region, forming part of the Hadiya Zone. It is home to a significant population of Hadiya and Danta Dubamo people. The Woreda is formed to the south by the Kembata Tembaro Zone, to the southwest by the Dawro Zone, to the west by the Omo River—which acts as a boundary with the Oromia Region—on the north by Gomibora, on the northeast by Limo, and on the southeast by Duna. Gimbichu serves as the administrative center of this woreda, with other notable settlements including Jajura. Portions of Soro were partitioned to create the Duna and Gomibora woredas.

According to the 2007 Census conducted by the Central Statistical Agency (CSA), Soro woreda has a total population of 188,858, confirming of 94,363 men and 94,495 women. Urban residents make up 16,885, or 8.94% of the total population. The predominant religion among the occupant is Protestantism, with 88.14% of the population relating as similar such, while 5.28% practice Ethiopian Orthodox Christianity and 4.94% are Catholic (12).

3.2. Study Design and Period

The descriptive study was done from September 1 to October 30, 2023.

3.3. Study Participant Procedures

The study analyzed 101 cases, including three fatalities, and excluded instances with inadequate information or those from other districts not part of the zonal administrative.

3.4. Data collection tools and procedure

Secondary surveillance data were collected, and a line list was used to collect and describe the cases and deaths. This line list includes socio-demographic details such as the patient's age, gender, and address, along with admission status, date of onset, and date of consultation at health facilities. It also contains clinical and laboratory information, including symptoms, medications administered specimen collection, and case outcomes.

3.5. Data Quality Control and Analysis

Specific checks were conducted to categorize variables, including standardizing date formats and converting to the Gregorian calendar. Incomplete data from the line list were identified and excluded from the study. Using the line list, we calculated frequencies, proportions, attack rates, and age-specific attack rates, and analyzed the data by time, place, and person using Microsoft Excel 2010.

3.6. Case Definitions

Cholera case definitions

Acute watery diarrhea (AWD)

Acute watery diarrhea is defined as the occurrence of three or more loose or watery (non-bloody) stools within a 24-hour period (5).

Suspected cholera case

In regions where a cholera outbreak has not been declared, any patient aged 2 years and older who presents with acute watery diarrhea accompanied by severe dehydration or who dies from acute watery diarrhea should be noted.

In areas where a cholera outbreak is declared: any person presenting with or dying from acute watery diarrhea should be noted (5).

Confirmed cholera case

A suspected case with Vibrio cholera O1 or O139 confirmed by culture or PCR and, in countries where cholera is not present or has been eliminated, the Vibrio cholera O1 or O139 strain is demonstrated to be toxigenic (5).

Cholera-endemic area

An area where confirmed cholera cases due to local transmission have been identified within the last three years can be defined as any subnational administrative unit, including states, districts, or smaller localities (5).

Cholera hotspot

A geographically confined area (such as a city, administrative level 2, or health district catchment area) where environmental, cultural, and/or socioeconomic factors promote the transmission of the disease and where cholera consistently persists or re-emerges. These hotspots are crucial in facilitating the spread of the disease to other regions (5).

Cholera outbreak

A cholera outbreak is defined by the occurrence of at least one confirmed case of cholera and evidence of local transmission(5).

Outbreaks may also occur in regions with sustained (year-round) transmission and are characterized by an unexpected rise (in terms of magnitude or timing) of suspected cases over two consecutive weeks, some of

which are laboratory-confirmed. Such increases necessitate investigation and appropriate responses through enhanced outbreak control measures.

A cholera alert is defined as the identification of two or more individuals aged 2 years and older (connected by time and location) who present with acute watery diarrhea and severe dehydration, or who die from acute watery diarrhea, occurring within the same area over one week.

OR

(b) One death from severe acute watery diarrhea in a person at least 5 years old OR

(c) One case of acute watery diarrhea testing positive for cholera by rapid diagnostic test (RDT) in an area (including those at risk for extension from a current outbreak) that has not yet detected a confirmed case of cholera.

Cholera elimination

Any country that reports no confirmed cases with evidence of local transmission for at least 3 consecutive years and has a well-functioning epidemiologic and laboratory surveillance system able to detect and confirm cases(5).

Laboratory Results

The Cholera Rapid Diagnostic Test (RDT) was done on the five initial cases documented at the Soro Cholera Treatment Centre (CTC), and all of them tested positive for Vibrio cholerae O1. Then, stool samples from two RDT-confirmed cases were forwarded to the Hawassa Regional Laboratory for culture confirmation. On July 7th, 2023, test results verified Vibrio cholera serotype O1 in both instances. Water samples from nine public standpipes and storage containers in all five districts were analyzed, and six of them tested positive for cholera.

3.7. Data dissemination

We generated a written report in both soft and hard copies and distributed it to Addis Abeba University, the School of Public Health, the Central Ethiopia Regional Health Bureau, and the Hadiya Zone Health Department.

4. Results

4.1. Mortality, Morbidity, and Symptoms

The cholera outbreaks were recorded in Soro Woreda, Hadiya zone. The causal agent of this outbreak was identified as cholera serotype O1. The first incidence included a thirteen-year-old who experienced intense watery diarrhea and vomiting two days later. He had gone to a cholera-affected area. The case was reported on March 2, 2023, with the start of diarrhea and diagnosed at Negist Elina Mohammed Memorial Hospital in Hosana Town. Another male youngster aged 10 from the first-case home arrived with comparable signs and symptoms and was admitted to the cholera treatment center (CTC) using the same information. A total of 101 cases and three fatalities with fatality rates (CFR 2.8%) were recorded.

According to the clinical information on the line list, 33 (32.6%) of cases had evidence of some dehydration, such as sunken eyes, dry mouth and tongue, restlessness, quick and weak pulse, drinking eagerly, and skin pinching moving back slowly, while 66 (65.3%) had signs of severe dehydration. In addition to signs and symptoms of dehydration, there were sunken eyes, a dry mouth, and a dry tongue. Several dehydrated cases were treated with ORS, IV ringer-lactate fluid, and antibiotics as indicated, whereas others were treated with simply ORS. Two (1.9%) of the cases exhibited no dehydration.

4.2. Description of Cases by Person, Place, and Time

By-person

During the 2023 cholera outbreak in Hadiya Zone, a total of 101 cases were reported, resulting in an attack rate of 1.01 per 10,000 people and three deaths, leading to a case fatality rate (CFR) of 2.9%. Among the cases, 57 (56.4%) were female and 44 (43.5%) were male. The median age of the cases was 12 years, with ages ranging from 1 to 85 years. The highest proportion of cases was found in the 15-44 age group (32 out of 101, or 43.6%), followed by the 5-14 age group (26 out of 101, or 25.7%). Females represented the largest share in the 15-44 age groups (32 out of 101, or 32%), while the 5-14 age group included 11 females (10.9%). The least affected age group comprised those less than five years old, with 6 cases (5.9%).

The age and gender-specific case fatality rate (ASCFR) was determined. Accordingly, the age-specific case fatality rate (ASCFR) of under five years (10%), 5-14 years (3.8%), 15-14 years (2.27%), and beyond forty-four years (0%), as well as the sex-specific case fatality rate (3.5%) in females and (2.3%) in males.

Table 1: Percentage of cholera cases by age groups and age-specific mortality in Hadiya zone, Central Ethiopia Region, Ethiopia, 2023.

		Male		Female		Total	
	Age category	Male case	Male (%)	Female case	Female (%)	Total case	Total %
	under 5	4	3.96	6	5.9	10	9.9
	5 to 14	15	14.85	11	10.9	26	25.7
	15 to 44	12	11.88	32	31.7	44	43.6
	>44	13	12.87	8	7.9	21	20.8
	Sub-total	44	43.56	57	56.4	101	100.0
	Age category	Male Mortality	Male ASCFR	Female Mortality	Female ASCFR	Total Mortality	Total ASCFR
	under 5	0	0	1	16.6	1	10
	5 to 14	0	0	1	9	1	3.8
	15 to 44	1	8.3	0	0	1	2.27
	>44	0	0	0	0	0	0
	Sub-total	1	2.3	2	3.5	3	2.9

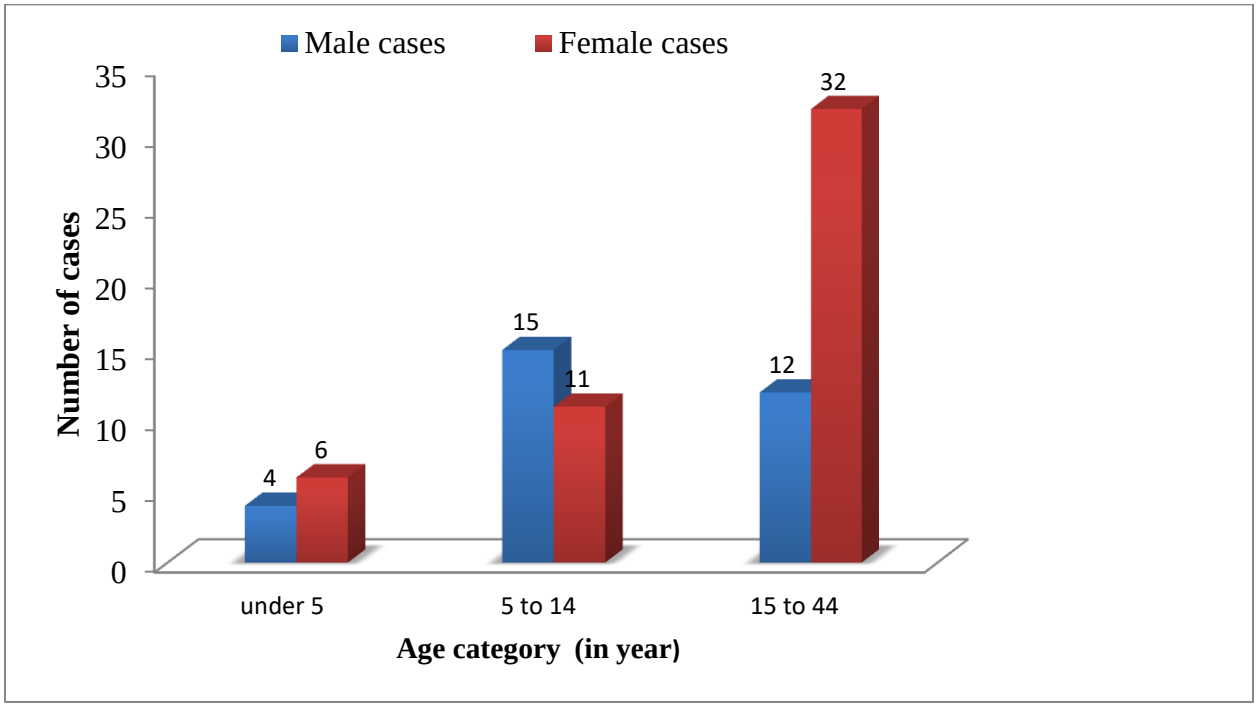


Figure 1: Distribution of cholera cases by gender and age category in Hadiya zone, Central Ethiopia Region, Ethiopia 2023.

By Place

Ten districts in Soro Woreda of Hadiya Zone have reported a cholera outbreak, including Oda, Jukera, Gidachamo, Bobe, Danemuma, Lodisa, Hankota, Omibelange, Washeba, and Shera. Oda district recorded the most cases (46/101, 45.5%), followed by Hankota district (21/101, 20.8%).

Table 2: Cholera attack and case-fatality rates categorized by district in Soro Woreda, Hadiya Zone, Central Ethiopia Region, Ethiopia, 2023.

Districts	Case	Mortality	Projected population in 2023	Attack rate per 10,000 population	Case fatality rate
Oda	46	2	23295	19.7	4.3
Jukera	24	0	25830	9.3	0.0
Gidachamo	1	0	3453	2.9	0.0
Bobe	1	0	4231	2.4	0.0
Danemuma	2	0	5439	3.7	0.0
Lodisa	1	0	3137	3.2	0.0
Hankota	21	1	48360	4.3	4.8
Omibelange	3	0	12395	2.4	0.0
Washeba	1	0	7654	1.3	0.0
Shera	1	0	5674	1.8	0.0
Grand total	101	3	139468	7.2	2.9

By Time

The outbreak began on July 7, 2023 and concluded on December 14, 2023. The epidemic pattern depicts a continuous common source and person-to-person transmission outbreak, with the epidemic curve having two unique peaks. The initial surge occurred on September 7th, with 23 cases. The illnesses were reported from three Oda districts. The second peak occurred on December 9th, with eleven cases.

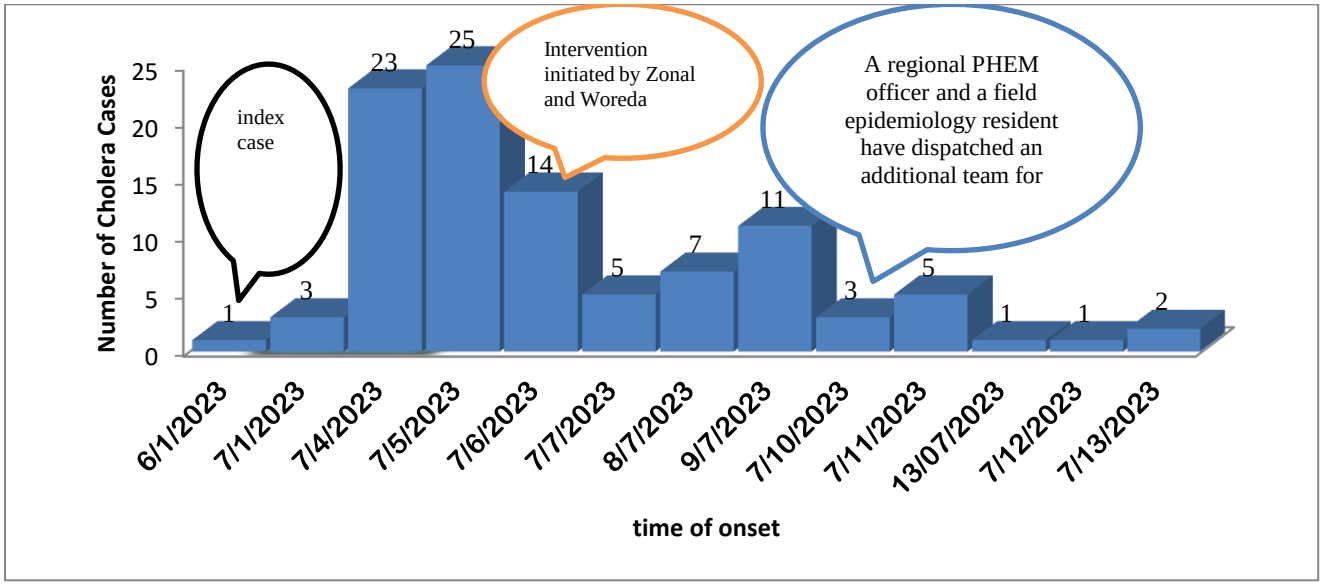


Figure 2: Epidemic curve for the cholera cases and deaths of Hadiya Zone, Central Ethiopia Region, Ethiopia, 2023.

4.3. Outbreak Response Measures and Challenges

4.3.1. Outbreak Response Measures

We activated the district outbreak quick response team and established a coordination group that included case management, water sanitation and hygiene (WASH), social mobilization, surveillance, logistics, and monitoring and evaluation (M&E), in line with the cholera outbreak response guidelines. We conducted active case searches both at health facilities and within the community, along with follow-up and disinfection of infectious sources. We implemented personal hygiene and sanitation initiatives, such as constructing latrines, raising awareness about their use, inspecting and disinfecting water sources, and providing chemical treatments to households and healthcare facilities. To communicate critical cholera prevention and control messages, we deployed vehicles to public gatherings (including religious events, schools, and markets), distributed educational materials (cholera booklets and posters), and utilized local FM radio.

4.3.2. Challenges Faced

The zonal and district epidemic preparedness plans had not been updated with contributions from relevant sectors and stakeholders. Documentation on latrine coverage, usage, and drinking water sources was inadequate, and there was a shortage of water treatment chemicals.

5. Discussions

The overall attack rate for the current cholera outbreak was 7.2 per 10,000 individuals. Our findings exceeded the attack rate of 1.6 per 10,000 recorded during the cholera outbreak in this Zone in 2017, as well as that of a study conducted in Oromia Regional State in 2010, which included the three Zones of Bale, Guji, and East Shewa (13). The difference may be attributed to the fact that, at that time, cases were not identified as cholera but were instead reported as acute watery diarrhea.

The recent investigation found a 2.9% case mortality rate at time of the cholera pandemic. This is higher than the WHO's recommendation. The World Health Organization advised that CFR due to cholera be no greater than 1% (14). The case fatality rate above the WHO recommended threshold. This type of high case fatality rate is frequently associated with inadequate case management. Furthermore, our findings were higher than those of the epidemic investigation conducted in Yemen in 2016, which found a CFR of (0.07%) (15). This difference might be due to underreporting in Yemen due to the emergence of the armed conflict in March 2015 in Yemen. Similarly, the case fatality rate is less than the case fatality rate recorded in Brong Ahafo Region, Ghana, in 2017 that was reported as CFR due to the cholera outbreak, which was 2.4% (16).

The current cholera outbreak showed a higher infection rate among females compared to males. This finding aligns with the results of an outbreak investigation conducted in Kaduna State, North-west Nigeria, in 2014, which indicated that females were disproportionately affected by the cholera outbreak (17)**.** However, our data contradicts the epidemic study conducted in the Raya Kobbo district of the Amhara region, Ethiopia, in 2017, which reported that the majority of cholera cases (60%) were among males (18)**.** This disparity may be linked to the fact that the sample size of Raya Kobo district was tiny, which means the total sample under this study was ten, whereas the sample size in our study was 101. Their sample size was far smaller than ours. However, our data contradicts the findings of the study conducted in the Brong Ahafo Region, Ghana, in 2017, which reported that males had been affected more (53.4%) by the cholera outbreak (16)**.** This deviation might be due to the lifestyle differences between two countries, like the place of eating and drinking establishments, especially for those who are out of their homes, and also to the sanitation of food and drink handlers.

The current cholera outbreak investigation revealed that 43.5% of all cases involved individuals aged 15 and older. This finding aligns with a study conducted in the Republic of Congo, which indicated that those aged 15 and above constituted the majority of cases (19). Additionally, our results are consistent with a study from

the Raya Kobbo district in the Amhara Region, which identified the 21-25 age group as the most affected (18). His age group is more likely to be exposed to food and beverages sold in markets and other public venues, where food handlers may not adhere to high standards of hygiene.

The cholera epidemics in Soro Woreda have recurred in Hadiya Zone, likely due to insufficient latrine coverage and usage, along with a lack of access to clean water. This year's outbreak impacted 10 districts, with Oda being the most severely affected, followed by Jukera.

The ongoing cholera outbreak in Hadiya Zone, Soro Woreda, started on July 7, 2023, and continued until December 14, 2023. The outbreak was attributed to cholera serotype O1. This finding aligns with the results of an epidemic investigation conducted by Charles Lwanga Noora in Ghana in 2014, which identified serotype O1 as the cause of a cholera outbreak that occurred during the summer season on July 30, 2014 (16). Similarly, our findings align with those of a study conducted in the Diulu Health Zone (Mbuji-Mayi City) in Kasa'i Oriental Province of the Democratic Republic of Congo. In that study, the cholera outbreak occurred from February to December and was attributed to cholera serotype O1 (19). Likewise, a study on a cholera outbreak conducted in Raya Kobbo, Amhara Region, Ethiopia, indicated that the epidemic took place from August 16 to 22, 2016, and was caused by cholera serotype O1 (18). In 1995, American microbiologist James B. Kaper and his team showed that V. cholerae serotype O1 can produce cholera toxin, which has historically been associated with epidemics following the rainy season (20). This finding indicates that regions prone to cholera, whether endemic or epidemic, are more susceptible to outbreaks during the rainy season.

6. Limitations

False positive cholera cases might have been included, suggesting that some cases do not meet the cholera case definition. For instance, fewer than five cases were recorded. This issue arose because the line list was filled out by various health professionals at lower-level cholera treatment centers, and not all community deaths may have been reported. Consequently, this also led to an undercount of cholera cases at the facilities.

7. Conclusions

The outbreak has shown high attack and case fatality rates, necessitating immediate action. Females are disproportionately affected, emphasizing the need for targeted health education. Individuals over fifteen years are the most impacted, indicating that interventions should focus on adult education and prevention measures. It is crucial to increase health resources in Oda and Jukera Districts, including mobile clinics and sanitation improvements.

8. Recommendations

- Use local media (radio, flyers, and social media) to disseminate information on hygiene practices, such as proper hand washing and safe food preparation.
- Organize mass immunization campaigns, targeting high-risk populations and ensuring easy access to vaccines.
- Prioritize the construction of latrines in high-density areas, ensuring they are accessible and well-maintained.
- Regularly review and update epidemiological preparedness plans based on the latest data and trends in cholera outbreaks.
- Distribute water treatment chemicals (e.g., chlorine tablets) to households and educate residents on their proper use.

References

1. Charnley GEC, Kelman I, Murray KA. Drought-related cholera outbreaks in Africa and the implications for climate change: a narrative review. Pathog Glob Health [Internet]. 2022;116(1):3–12. Available from: https://doi.org/10.1080/20477724.2021.1981716

2. Elimian KO, Musah A, Mezue S, Oyebanji O, Yennan S, Jinadu A, et al. Descriptive epidemiology of cholera outbreak in Nigeria , January – November , 2018 : implications for the global roadmap strategy. 2019;1–11.

3. Dinede G, Abagero A, Tolosa T. Cholera outbreak in Addis Ababa, Ethiopia: A case-control study. PLoS One [Internet]. 2020;15(7):1–12. Available from: http://dx.doi.org/10.1371/journal.pone.0235440

4. Ali M, Nelson AR, Lopez AL, Sack DA. Updated global burden of cholera in endemic countries. PLoS Negl Trop Dis. 2015;9(6):1–13.

5. Interim Guidance Document on Cholera Surveillance Global Task Force on Cholera Control (GTFCC) Surveillance Working Group. 2017.

6. Ocasio DV, Juin S, Berendes D, Heitzinger K, Prentice-mott G, Desormeaux AM. Cholera Outbreak — Haiti , September 2022 – January 2023. 2023;72(2).

7. Al-Tawfiq JA, Chopra H, Dhama K, Sah R, Schlagenhauf P, Memish ZA. The cholera challenge: How should the world respond? New Microbes New Infect. 2023;51:10-13file:///C:/Users/user/Downloads/Prevalence%20.

8. Mashe T, Chaibva B V, Nair P, Sani KA, Jallow M, Tarupiwa A, et al. Descriptive epidemiology of the cholera outbreak in Zimbabwe 2018 – 2019 : role of multi- - sectorial approach in cholera epidemic control. 2023;(September 2018):1–8.

9. Report ES. Multi-country outbreak of cholera. 2023;(June):1–22.

10. Multi-Sectorial Cholera Elimination Plan Ethiopia. 2022.

11. Pet M. Emergency Plan of Action (EPoA) Ethiopia : Cholera outbreak response A . Situation analysis. 2019;(July):1–16.

12. Central Statistical Agency of Ethiopia. Population and Housing Census 2007 Report. Cent Stat Agency, Addis Ababa [Internet]. 2007;385. Available from: http://www.csa.gov.et/surveys/Population and Housing census/ETH-pop-2007/survey0/data/Doc/Reports/National_Statistical.pdf

13. Bartels SA, Greenough PG, Tamar M, VanRooyen MJ. Investigation of a cholera outbreak in Ethiopia's Oromiya Region. Disaster Med Public Health Prep. 2010 Dec;4(4):312–7.

14. The CORE Group Polio Project – Ethiopia, Ethiopian Health and Nutrition Reaserch Institute E, IQVIA, Modules P, Institute EPH, Ministry F, et al. Guideline on CHOLERA OUTBREAK MANAGEMENT Ethiopia Ethiopian Health and Nutrition Research Institute Federal Democratic Republic of Ethiopia. October [Internet]. 2012;2(June):1–140. Available from: https://www.ephi.gov.et/images/guidelines/national-cholera-guideline.pdf

15. Altmann M, Suarez-bustamante M, Soulier C, Lesavre C. First Wave of the 2016-17 Cholera Outbreak in Hodeidah City , Yemen – Acf Experience and Lessons Learned. 2017;1–16.

16. Noora CL, Issah K, Kenu E, Bachan EG, Nuoh RD, Nyarko KM, et al. Large cholera outbreak in Brong Ahafo. BMC Res Notes. 2017;4–11.

17. Descriptive epidemiology of a cholera outbreak in Kaduna State, Northwest Nigeria, 2014. 2017;8688:1–8.

18. Feyisa GC, Hailu T, Beyene Z. Acute watery diarrhea outbreak investigation in Raya Kobbo district, Amahara region of Ethiopia-consequence of drought and poor sanitation: A case-control study. J Heal Med Nurs. 2017;1(2):44–59.

19. Dongmo A, Tshizemba MA. Descriptive epidemiology of Cholera Outbreak , Kasai Oriental Province , Democratic Republic of Congo , 2018 (Characteristics in Mbuji-Mayi city vs Rural area). 2019;2018:1–13.

20. Kaper JB, Morris JG, Levine MM. Cholera. 1995;8(1):48–86.

Chapter II: surveillance data analysis report

2. A five-years retrospective malaria surveillance data analysis in Silte Zone, Southern Nations Nationalities People's Region, Southern Ethiopia, 2023.

Abstract

Background: Malaria, caused by Plasmodium species, is a severe public health issue in Ethiopia, causing high mortality and poverty. The Silte Zone's surveillance data analysis aimed to assess disease trends and recommend control and prevention measures, assessing the incidence and effectiveness of compliant control programs.

Objective: To describe malaria cases, deaths, positive rates by species, and trends by person, time, and area in the Silte Zone of Ethiopia's Southern Nation Nationalities Peoples Region.

Methods: A retrospective document examination was carried out. The national public health emergency management (PHEM) database was used to collect malaria monitoring data throughout a five-year time (2018-2022). Data were gathered, inputted, cleaned, analyzed, and interpreted using Microsoft Excel 2010 and Arc GIS. Results were presented using a variety of tables, figures, numbers, and chart.

Results: Between 2018/2019 and 2021/2022 GC, 35.3% cases visiting the outpatient department (OPD) and laboratory were tested for malaria. There were 36619 verified malaria cases, with a test positivity rate of 36.12%. Plasmodium falciparum accounted for 64.3%, followed by vivax at 35.6%. The average yearly prevalence rate was 10.14 per 1000 at-risk groups per year. In 2021/2022, the death rate was 0.01%, with clinical cases accounting for 1.58%. In terms of age, 38.2% were under the age of five, 24.9% were between five to fourteen, and 36.8% were aged fifteen or over. The Zonal ITN utilization rate was 32%, which is quite low in comparison to the national plan for high use (>85%) and has the potential to significantly increase malaria incidence.

Conclusion and recommendation: The study indicated that malaria is a public health concern, with P. falciparum being the most common species, followed by P. vivax. Malaria is still a leading cause of morbidity in outpatient visits. Over the last five years, confirmed community malaria cases have followed an intermittent trend. However, clinical malaria cases, hospitalizations, and deaths in the study region have occasionally approached zero. As a result, the Woreda Health Office and other stakeholders should strengthen evidence-based malaria control and prevention interventions in order to disrupt disease transmission and eventually reduce malaria cases in the Silte Zone.

1. Introduction

1.1. Background

According to the most recent World Malaria Report, there were 247 million malaria cases in 2021, compared to 245 million in 2020 (1). Malaria deaths were expected to reach 619,000 in 2021, up from 625,000 in 2020. During the coronavirus pandemic, the number of malaria cases worldwide surged by 14 million over the last two years, as did the number of deaths caused by interruptions. Malaria is one of the most common illnesses among low-income populations in developing countries (2). Most of the global malaria burden is found in sub-Saharan Africa, with most cases and deaths occurring in this region of the world, accounting for the majority (95%) of this case(1). Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%) and Niger (3%) accounted for about 51% of all cases worldwide (1). It has a negative impact on human health and economic growth in many developing nations, particularly sub-Saharan Africa (1)(3)(4).

The most common causes of human malaria are four species, namely *Plasmodium vivax*, *Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale,* and sometimes a fifth species, *Plasmodium knowlesi,* which is zoonotic(5). The most prevalent and pathogenic malaria parasite, most associated with serious illness and death, accounting for 99.7% of malaria cases in the African Region of WHO, 70.9% in Central America, 20.8% in South America and 4 .8% in Asia is *P falciparum*(6). *Plasmodium falciparum* is responsible for most human infections, but *Plasmodium vivax* has the widest geographic range(7). Ethiopia, as one of these countries, suffers from this disease which poses a problem for the country's health and economy. The prevalence of malaria in Ethiopia varies with climate, rainfall patterns, and altitude(8). A 2021 systematic review showed that the highest malaria prevalence was in the Southern Nations, Nationalities, and Peoples Region (SNNPR) (16.17%), followed by Oromia Regional State (13.11%) and Amhara Regional State ((12.41%). Regional State (13.11%) and Amhara Regional State (12 .41%)(12.41%)(9).

According to EMIS 2015, the total malaria incidence in Ethiopia across all age groups residing in malaria-prone areas was 0.5% and 1.2%, respectively, based on microscopy and RDT. Gambella (6%) and Benshangul Gumuz (3%) had the greatest microscopy prevalence (10). The Ethiopian Federal Ministry of Health (FMoH) intends to eliminate malaria in specific geographical areas with historically low malaria transmission and zero malaria-related deaths by 2020 (11).

According to Ethiopia's Federal Ministry of Health, malaria affects 75% of the country's land area and threatens 68% of the entire population (12). This represents more than 74 million of the country's population. (11)(12). In Ethiopia, Plasmodium falciparum and Plasmodium vivax are the two predominant malaria parasites, which are distributed throughout the country and are responsible for 60% and 40% of malaria cases, respectively, and there are two main seasonal transmissions of malaria that occur during the months September to December and March to May (13).

Malaria is a completely preventable and treatable disease, provided current recommended measures are properly implemented. This include vector control through the use of long-lived insecticide-treated nets (LLINs), Indoor Residual Spraying (IRS) and, in some specific settings, larvae control, chemoprevention for the most vulnerable populations, particularly pregnant women and infants, confirmation of malaria diagnosis by microscopy or rapid diagnostic tests (RDTs) for each suspected case and timely treatment with appropriate antimalarial drugs. According to the World Health Organization (WHO), strategic approaches to malaria control encompass two main areas: prevention and case management(14).

Accordingly, the World Health Organization recommends universal access to long-lived insecticide-treated nets (LLINs) (100%) and the use of household-level household nets and indoor residue spraying (IRS) >85% as the most powerful and effective vector control strategies to rapidly reduce malaria transmission the burden of malaria morbidity and mortality(15).

Despite deliberate attempts to control malaria, it remains a difficult disease. It is also critical to assess the disease's severity to close gaps and increase the preventative and control intervention mechanisms. This data study evaluates the five-year Silte Zone malaria case reports (SNNPR) for Ethiopia from 2018 to 2022 G.C. The study's goal is to analyze the prevalence and trends of malaria in the Silte Zone. It was demonstrate the changes from earlier cases of scaling up malaria control efforts, the malaria burden, and the scope of the difficulties.

1.2. Statement of problem

Globally, an estimated 2 billion malaria infections and 11.7 million deaths were prevented between 2000 and 2021. Malaria is preventable and treated, but it yet kills approximately 608,000 people per yea (16). Approximately 95% of malaria deaths worldwide occurred in 29 countries (16). In 2021, four countries accounted for slightly more than half of all malaria deaths worldwide: Nigeria (31%), the Democratic Republic of the Congo (13%), Niger (4%) and the United Republic of Tanzania (4%) (17). In 2021, in 38 moderate and high transmission countries in the WHO African Region, there were an estimated 40 million pregnancies, of which 13.3 million (32%) were exposed to malaria infection during pregnancy. In the WHO sub-region, west Africa had the highest prevalence of malaria exposure during pregnancy (40.7%), closely followed by central Africa (39.8%), while east and southern Africa had 20% (18). Around 75% of Ethiopia's landmass is considered malarial, and around 68% (54 million) of the Ethiopian population lives in malaria-risk zones (19)(20).

1.3. Significant of the Study

Malaria is a significant public health issue and a priority disease that requires regular monitoring. The National Strategic Plan for Malaria Prevention, Control, and Elimination emphasizes the importance of analyzing surveillance data as the primary approach to eliminating malaria and ultimately halting its transmission. Comprehensive tracking of malaria cases and deaths is essential to identify high-risk areas and populations, enabling the development of targeted preventive and control strategies. Consequently, analyzing malaria data is crucial for recognizing trends and the spread of the disease, which were support the design and implementation of effective interventions to improve health outcomes. This study was presented a descriptive epidemiological analysis of malaria in the Silte Zone over a five-year from 2018 to 2022.

2. Literature Review

P. *falciparum* and *vivax* account for 95% of malaria cases worldwide. In Ethiopia, *P. falciparum* and *P. vivax* represent approximately 60-70% and 30-40% of malaria cases, respectively. *P. falciparum* is the predominant species in areas prone to malaria epidemics, leading to severe symptoms and accounting for nearly all malaria-related fatalities (11). The research carried out in Bata District, Equatorial Guinea, revealed that the overall prevalence of malaria, as determined by rapid diagnostic tests (RDT), was 46.2% (21).

Malaria surveillance data from Ethiopia indicates that the prevalence of malaria among all outpatients (both clinical and confirmed) in the general population averaged 23.4 cases per 1,000 people annually between 2005 and 2008. During this period, the average rates of inpatient malaria admissions and deaths were 6.4 per 10,000 and 2.3 per 100,000, respectively. *P. falciparum* and *P. vivax* accounted for 67% and 33% of these cases, respectively (22). Health-related data revealed that the total number of laboratory-confirmed and clinical malaria cases in 2014/2015 reached 2,174,707 (23). Out of these cases, 1,867,059 (85.9%) were confirmed through either microscopy or rapid diagnostic tests (RDTs). Among these, 1,188,627 (63.7%) were *P. falciparum*, while 678,432 (36.3%) were *P. vivax* (23).

A cross-sectional study carried out in the Wolaita zone of southern Ethiopia reported an average annual incidence of malaria of 21,151 cases, with a test positivity rate of 33.27% (24). *P. falciparum* was the most frequently reported species, representing 71.80% (2). The majority of reported cases consistently occurred within the 15-year-old age group, which accounted for 58.80% of the overall prevalence (24). A cross-sectional study conducted in the low-transmission In the Hadiya Zone of Ethiopia, a test positivity rate of 25.8% was observed using microscopy. Infections from *P. vivax* accounted for 71.7%, while *P. falciparum* infections, including mixed cases, made up 28.3% (25). A cross-sectional study carried out in Butajira district in southern Ethiopia found that the prevalence of malaria cases was 9.3 per 1000 people (23). Among the Plasmodium species identified, 86.5% were *Plasmodium vivax*, while *Plasmodium falciparum*, including mixed infections, accounted for 13.5% (23).

3. Objective of study

3.1. General objectives

To describe malaria cases, mortality, positivity rates by species and their trends over time, by individual characteristics, and by geographic location in the Silte Zone of the Southern Nations, Nationalities, and Peoples Region, Ethiopia.

3.2. Specific objectives

- To analyze the morbidity and mortality associated with malaria cases in Hulbareg Woreda.
- To analyze malaria cases by place, time, and person in Hulbareg Woreda.
- To analyze malaria positivity rate and distribution of malaria species in Hulbareg woreda.

4. Methodology

4.1. Study area

Malaria surveillance data was analysed in the Silte Zone (Figure 3). The zone was administratively organized into ten districts (locally known as Woreda) and five town administrations. There are 21 urban and 183 rural administrative kebeles 182456-house hold and 894036 populations living in rural areas. The Zone has 723,599 at-risk populations with 130 malaria kebeles and 147,673 malaria-prone households. Total Health Post 196, Functional Health Center (34), one Comprehensive Specialized Hospital, 3 Primary Hospital, 26 Private Medium Clinic, three Other Clinic (Polyclinic, University Hospital and Prison Clinic. The zone experiences a yearly temperature of 22.3 ºC (72.14 ºF) and receives approximately 164.62 millimeters of precipitation annually.

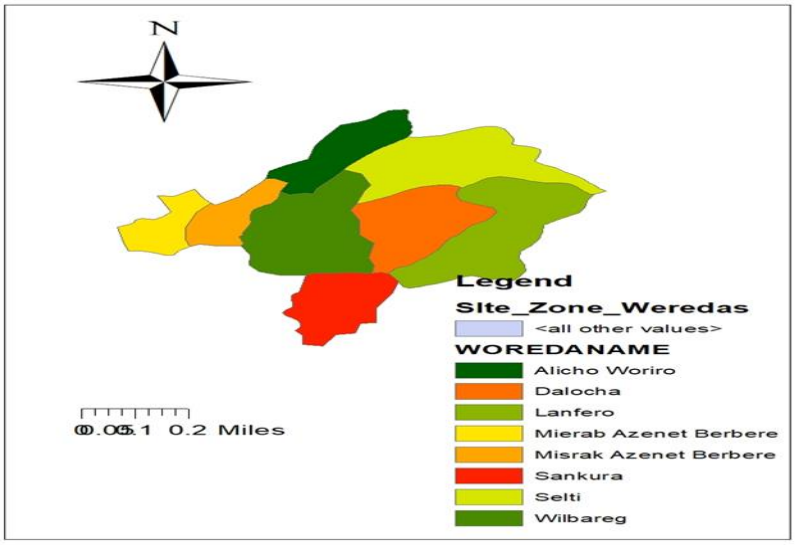


Figure 3: Map of Silte Zone, Southern Nation Nationalities Peoples Region, Ethiopia, 2023.

4.2. Study Period

Secondary data on total malaria cases and deaths over five years were collected and analyzed from February 25 to March 15, 2023.

4.3. Study Design

A retrospective analysis of surveillance data was conducted.

4.4. Source Population

The entire population at risk for malaria in the Silte Zone catchment area.

4.5. Study Population

Malaria cases recorded in the Silte Zone over the past five years, specifically from 2018 to 2022.

4.6. Study Unit

The study unit comprised all individuals associated with suspected and confirmed malaria cases, including those who died, as reported to the zonal health department.

4.7. Sample Size

The study included all clinically diagnosed and laboratory-confirmed malaria cases reported from 2018 to 2022.

4.8. Data collection tools and process

The Zone Public Health Emergency Management collected weekly monitoring data from 2018 to 2022. Before analysis, the data was meticulously cleaned and validated to ensure accuracy, resolve missing values, and correct any coding errors. The analysis was conducted using Microsoft Office Excel 2010 .

4.9. Data Quality Management

The completeness of the secondary data across all five years was evaluated in relation to age, sex, districts of the patients, and the species of malaria. Records lacking this information were excluded from the analysis to ensure the integrity and reliability of the data.

4.10. Data Analysis and Methodology

The analysis and organization of five years of monthly malaria surveillance data, collected from 2018 to 2022, were conducted using Microsoft Excel 2010. The numerator consisted of the number of malaria cases reported during this period, while the denominator included demographic data pertaining to the population at risk of malaria across various districts within the Silte Zone. Incidence rates were computed as the number of malaria cases per 1,000 individuals, whereas malaria mortality rates were determined as the number of malaria-related deaths per 100,000 individuals, utilizing the at-risk population figures for the respective districts and zones. The population at risk was estimated based on data from the 2007 Ethiopian Central Statistical Agency.

4.11. Data Dissemination

A comprehensive report was compiled and made available in both printed and digital formats. This report was distributed to Addis Ababa University/School of Public Health, the Southern Nations, Nationalities, and Peoples' Regional Health Bureau, and ultimately to the Silte Zone Health Department.

4.12. Ethical Considerations

The data collection process began after obtaining a written consent letter from the SNNPR Health Office, which was addressed to the Silte Zone Public Health Department for ethical approval. After discussing the study's objectives and methodology, authorization was granted by the head of the health department of the zone before proceeding with data collection.

4.13. Operational definition

Standard Case description of malaria - taken from PHEM guideline

Suspected Case description:

Any individual presenting with fever or fever accompanied by headache, chills, back pain, sweats, muscle pangs, nausea, and vomiting is clinically diagnosed with malaria (26).

Verified Case description:

A suspected case is verified when microscopy or rapid diagnostic tests (RDT) detect Plasmodium parasites (26).

Presumed malaria (clinical malaria):

Suspected malaria case without a individual test to confirm malaria but nevertheless treated

Presumptively as malaria (26).

Community Case Description of Malaria

Malaria any person with fever OR fever with headache, back pain, chills, rigour, sweating, muscle pain, nausea, and vomiting OR suspected case confirmed by RDT (26).

Clinical case: malaria case positive by signs and symptoms without laboratory confirmatory test (microscopy or rapid diagnostic test (27).

Malaria incidence: Number of newly diagnosed cases of malaria during a defined period in a specific population (27).

Malaria case: overall malaria positive by microscopy and RDT) and clinical case. Malaria Area: Area where malaria transmission is occurring or has occurred within the last 3 years (27).

Rapid Diagnostic Test: Lateral-flow immune chromatographic device for the rapid detection

of malaria parasite antigens (27).

Malaria Control: reducing the burden of malaria disease to a level that is no longer a public health problem. Reduction of the incidence of human malaria parasite infection to 0 in a given geographic area as a result of targeted efforts; further measures to prevent retransmission are required. Intervention measures are no longer necessary after eradication has taken place (27).

Malaria outbreaks: Crossing the threshold line OR doubling the number of malaria cases compared to the prior year of reported WHO epidemic week (27).

Populations' high risk for malaria are those people living in areas where the number of reported cases is ≥1 per 1000 per year (27).

Populations at low risk for malaria: are those living in areas with <1 case of malaria per 1000 population.

Malaria action threshold level: malaria cases crossing the norm line or doubling of cases compared to the same week of the previous year (27).

Malaria epidemic

Malaria threshold level: A situation when the number of malaria cases is in excess of the normal number at a specific period of time and place. thus, the "normal" anticipated number has to be estimated by using a third quartile (second largest number) of the past five year's weekly data (27).

5. Results

5.1. Malaria morbidity and mortality

The average annual malaria incidence rate over the past five years was 36,619 cases among a population of 3,574,770, resulting in a rate of 10.24 cases per 1,000 people at risk per year. This rate varied between 1 and 25 cases per 1,000 population at risk during that period (Figure 4).

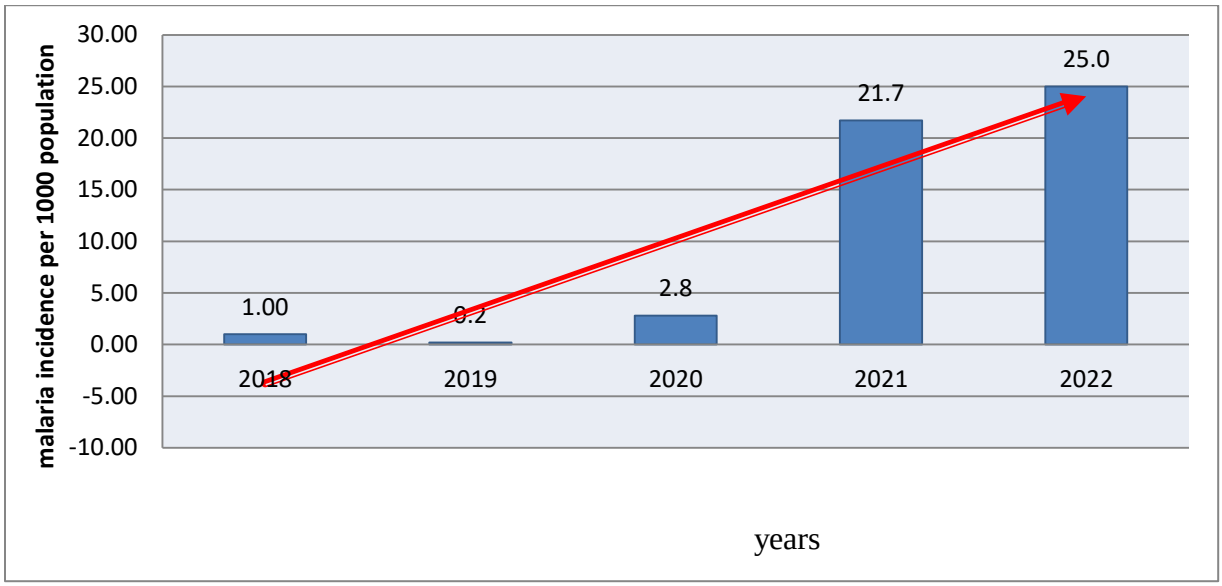


Figure 4: Trend of annual malaria incidence per 1000 in Silte Zone Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

Malaria Test Positivity Rates:

Over the past five years, blood smears (BF) constituted 32,042 tests, making up 87.5% of all laboratory tests conducted, while rapid diagnostic tests (RDT) accounted for 4,577 tests, or 12.5%. The average test positivity rate for both RDT and BF during this period was 32.16%, with a range from 1.7% to 65%. Among confirmed malaria cases, *P. falciparum* 22064 (60%), followed by 14555 (40%) were P. vivax (ranging from 36% to 42%) (Figure 5).

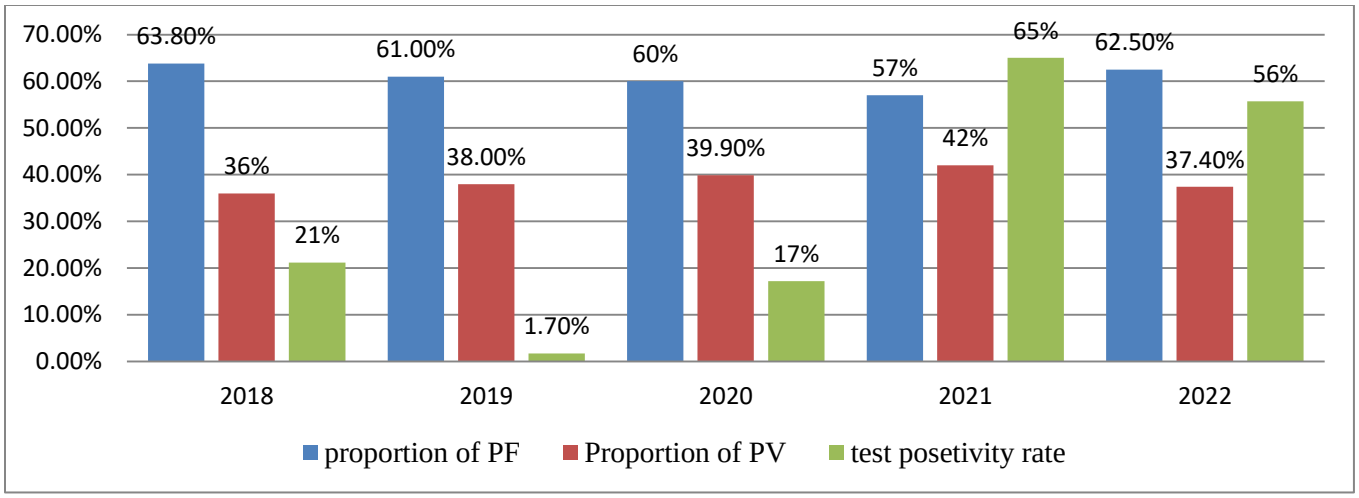


Figure 5: Trend of annual test positivity rate and plasmodium species in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018-2022.

Over the past five years, the average annual burden of malaria cases from outpatient morbidity was 12.81% for *Plasmodium falciparum* and 7.2% for *Plasmodium vivax*. Inpatient malaria cases represented 0.045% of a total of 165 inpatient cases. There was one recorded death, accounting for a mortality rate of 0.01%. Additionally, malaria cases in pregnant women made up 0.4% of total malaria cases. The estimated average annual inpatient malaria case rate was 0.045 per 10,000 people at risk, while the inpatient malaria fatality rate was 0.01 per 100,000 people at risk. The mean annual percentage of clinical malaria cases was projected to be 1.58%, ranging from 1.4% to 3.8%. (See figure 6).

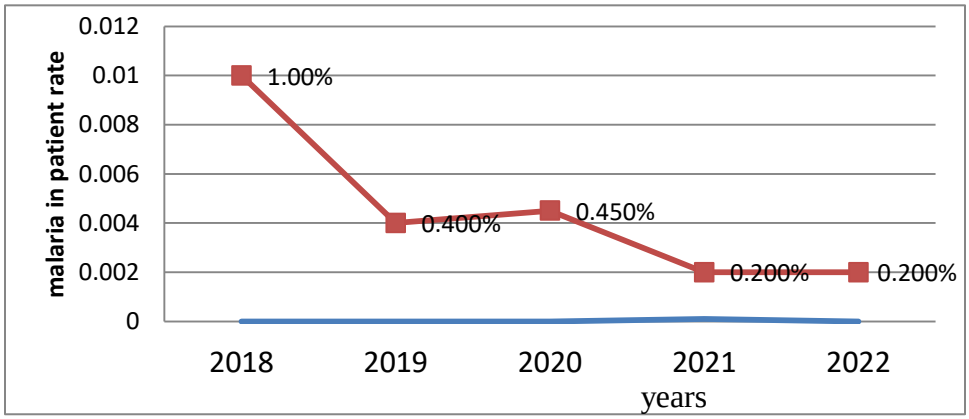


Figure 6: Trend of death and inpatient malaria cases rate in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

Figure 7 indicates the malaria death rate decreased from time to time.

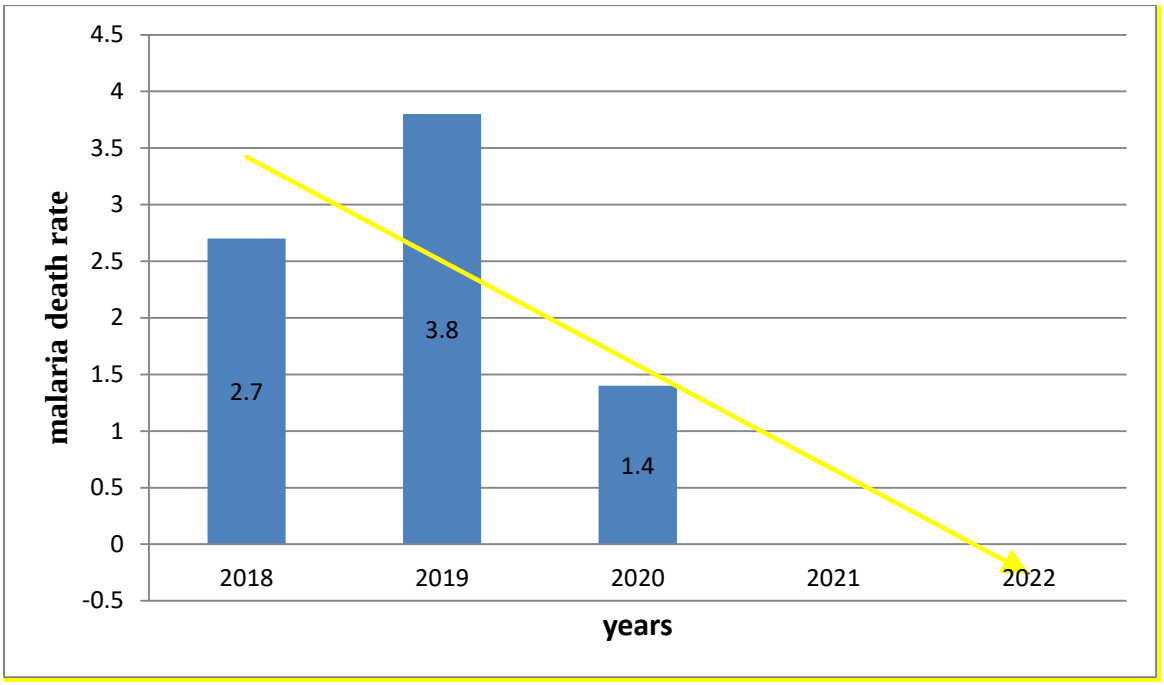


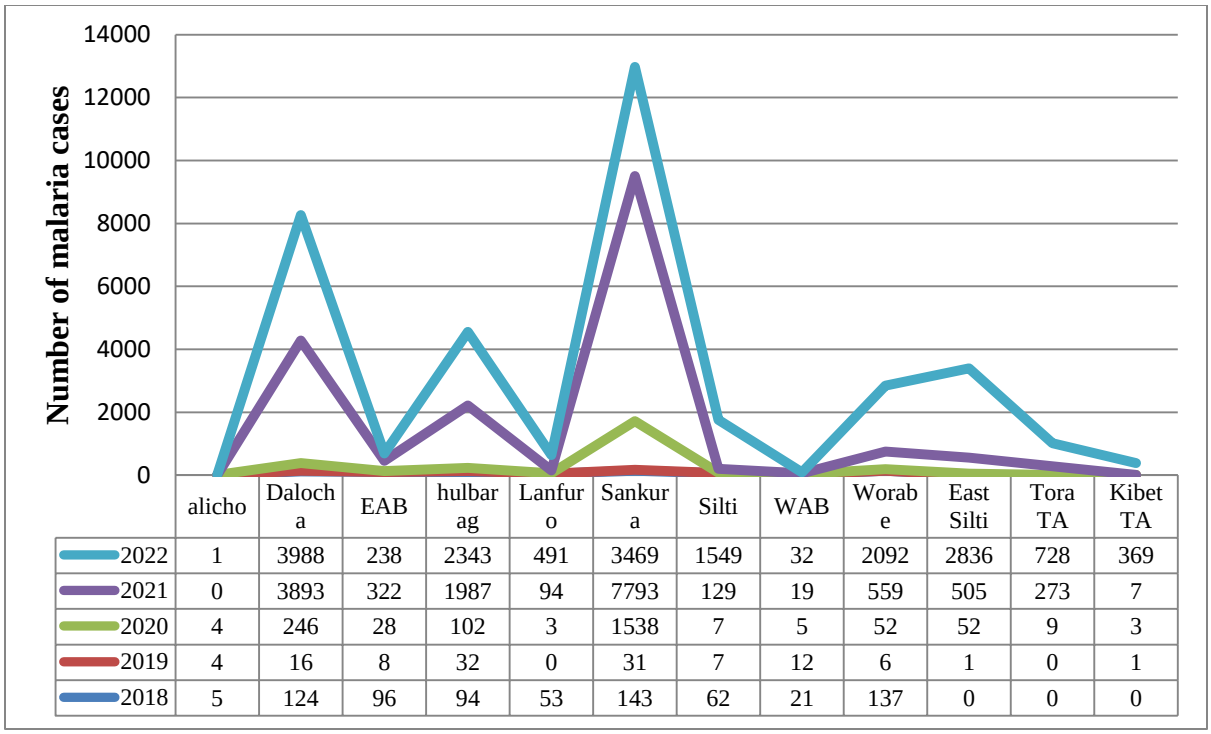
Figure 7: Trend of clinical cases in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

5.2. Malaria incidence by Woreda

During the 2018-2022 the majority of the cases were recorded in Sankura (35.4%) followed by Dalocha (22.5%) Hulbareg (12.4%) and East Silti (9.3%) and the lowest malaria cases were from Alicho (0.038%), WAB (0.24%) (See table 4).

Table 3: Total malaria cases distribution by Woreda in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

Woreda	2018	2019	2020	2021	2022	Total cases (n)	Percent (%)
ALicho	5	4	4	0	1	14	0.04
Dalocha	124	16	246	3893	3988	8267	22.6
EAB	96	8	28	322	238	692	1.9
Hulbarag	94	32	102	1987	2343	4558	12.4
Lanfuro	53	0	3	94	491	641	1.8
Sankura	143	31	1538	7793	3469	12974	35.4
Silti	62	7	7	129	1549	1754	4.8
WAB	21	12	5	19	32	89	0.2
Worabe	137	6	52	559	2092	2846	7.8
East Silti	0	1	52	505	2836	3394	9.3
Tora TA	0	0	9	273	728	1010	2.8
Kibet TA	0	1	3	7	369	380	1
zonal	735	118	2049	15581	18136	36619	100



	alicho	Dalocha	EAB	hulbarag	Lanfuro	Sankura	Silti	WAB	Worabe	East Silti	Tora TA	Kibet TA
2022	1	3988	238	2343	491	3469	1549	32	2092	2836	728	369
2021	0	3893	322	1987	94	7793	129	19	559	505	273	7
2020	4	246	28	102	3	1538	7	5	52	52	9	3
2019	4	16	8	32	0	31	7	12	6	1	0	1
2018	5	124	96	94	53	143	62	21	137	0	0	0

Figure 8: Five year malaria case trend,by woreda, in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

5.3. Malaria distribution by places vs species

Of the total confirmed malaria cases, 36,619 were confirmed using both microscopy and rapid diagnostic tests (RDTs); of these, 22064 (64.2%) were P. falciparum and 14555 (35.6%) were P. vivax. West Azernet Berbere had the largest number of P. falciparum malaria cases (92.1%), followed by East Azernet Berbere with 191 (80.3%) and Lanfuro with 379 (77.1%). The Woredas with the most p. vivax patients were Sankura 3018 (87%) East Silti 1770 (62.4%) Kibet TA 221 (60%) (Figure 9).

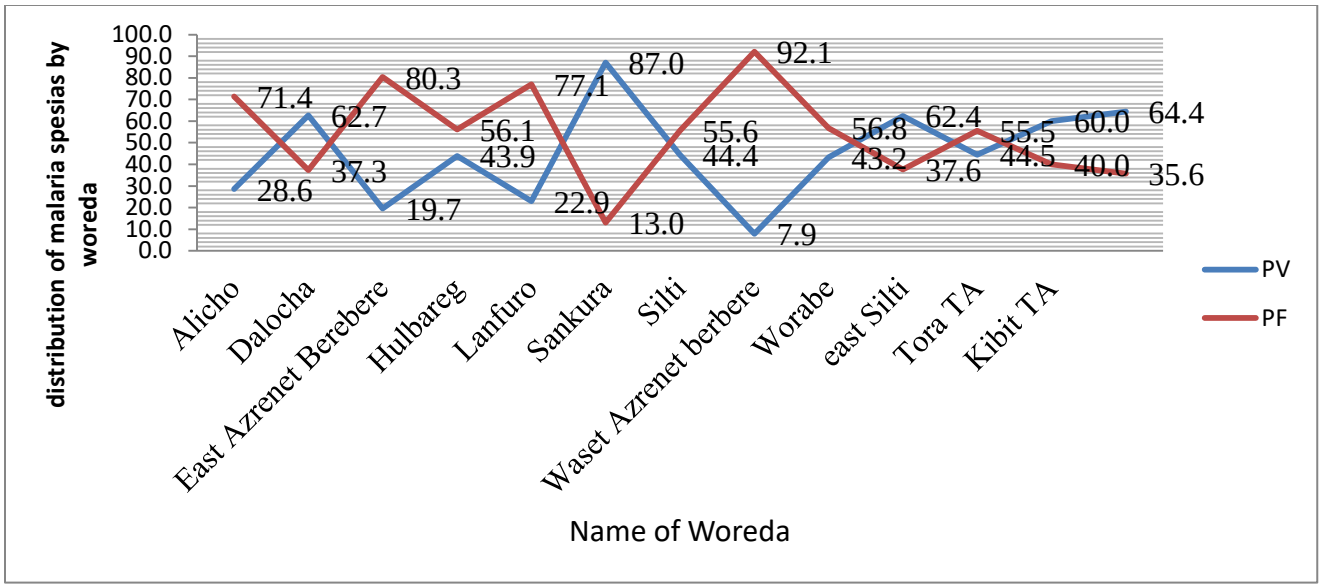


Figure 9: species of malaria distribution by woredas from 2018-2022 GC in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

5.4. Malaria distribution by person (Age and sex)

According to disease prevention coor-process report (hamle2010-sene 2014 E.C) from the total of 36619 malaria cases , the highest cases were reported in age group under 5 years 13989 (38.2%) cases and in age group >=15 years 13479(36.8%) cases. *P. falciparum* was high in >=15 years and P. vivax malaria cases high in age group 5 year and both malaria species predominant among male (Table 5).

Table 4: malaria distribution by age category and sex in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

	age &sex								
	under-5 years			5-14 years			>=15 years		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Confirmed cases	7946	6043	13989	5044	4110	9154	6873	6603	13476
total case	7946 (56.8%)	6043 (43%)	13989	5044 (55%)	4110 (44%)	9154	6873 (51%)	6603 (49%)	13476
Age categories	under-5 years			5-14 years			>=15 years		
total malaria case	13989(38.2%)			9154(24.9%)			13476(36.8%)		

Since malaria is not an age-specific disease, all age groups are at risk of malaria. In the past five years, cases of malaria have been observed in both under-five and older children.

Malaria affects both sex, but magnitude of cases in both sexes was different (Figure 10).

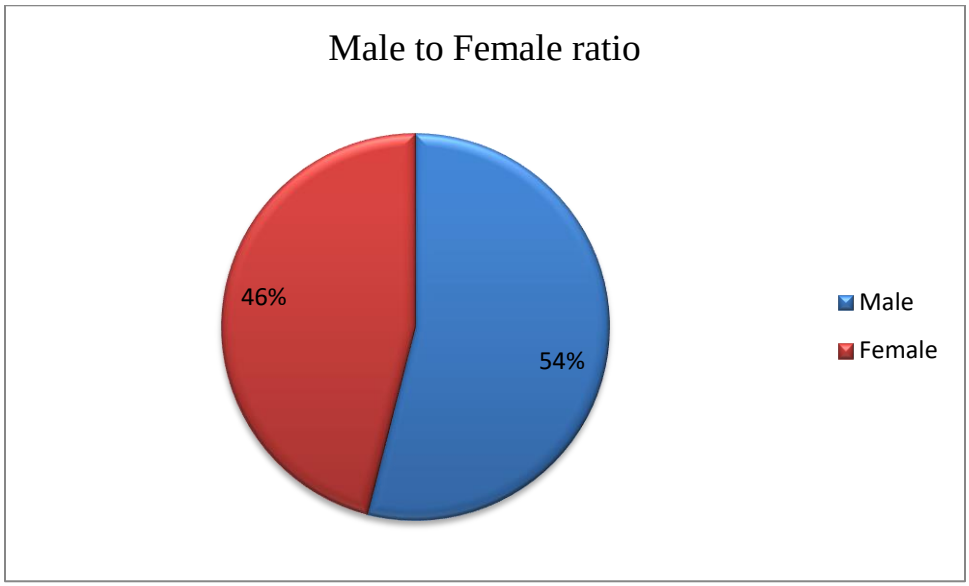
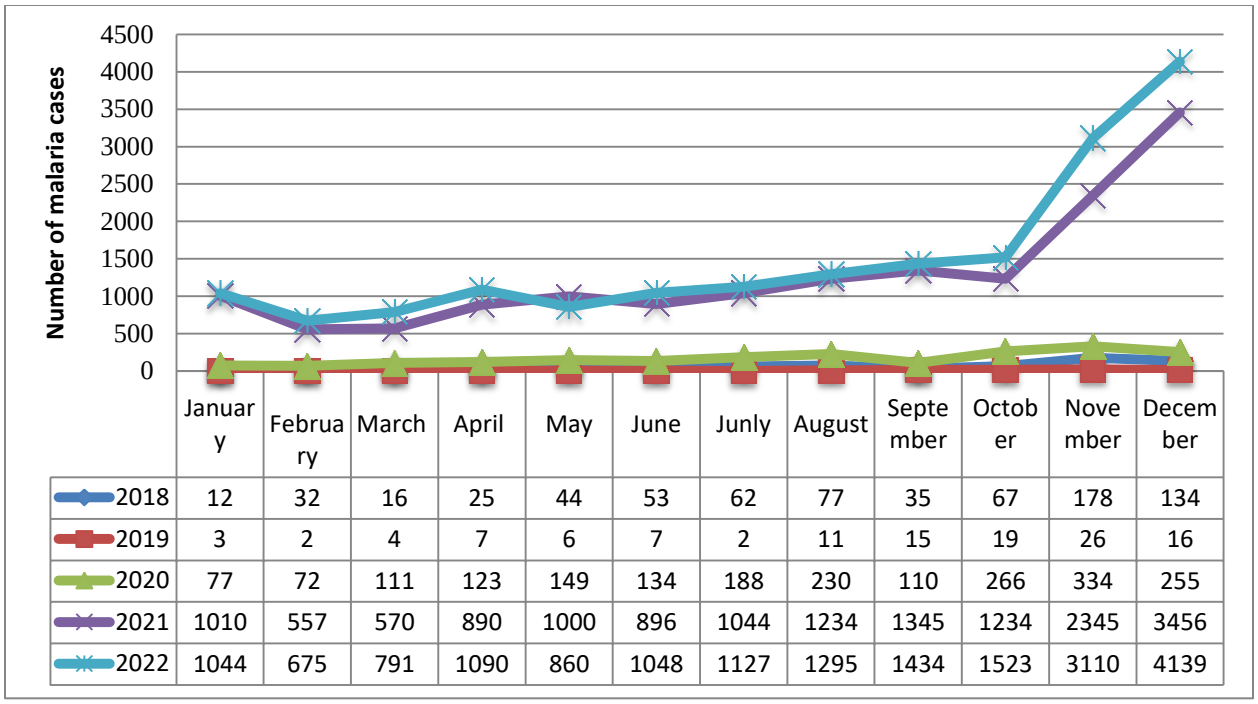


Figure 10: Malaria case distributions by sex, Silte zone, Southern Nation Nationalities of Peoples Region, Ethiopia, from 2018–2022.

The study indicates that the highest peaks of malaria transmission typically occur between September and December, following heavy rains in July, August, and September. A secondary peak is observed in May after lighter rains in March and April. Notably, in 2022, there was a significant surge in malaria cases specifically during the months of October to December (Figure 11).



	Januar y	Februa ry	March	April	May	June	Junly	August	Septe mber	Octob er	Nove mber	Decem ber
2018	12	32	16	25	44	53	62	77	35	67	178	134
2019	3	2	4	7	6	7	2	11	15	19	26	16
2020	77	72	111	123	149	134	188	230	110	266	334	255
2021	1010	557	570	890	1000	896	1044	1234	1345	1234	2345	3456
2022	1044	675	791	1090	860	1048	1127	1295	1434	1523	3110	4139

Figure 11: Malaria distribution by case by season in Silte zone, Southern Nation Nationalities of Peoples Region, Ethiopia, 2022.

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5.5. Vector control measures

5.5.1. ITN Distribution

Since 8 Woreda in the zone are affected by malaria, insecticide net distribution is very important to protect people from mosquitoes as a physical barrier. It can be used for a period of three to five years. In the Silte zone, the ITN distribution in recent years occurred in two years 2019 and 2022, the GC. ITN coverage of the zone was 99% and 84% respectively

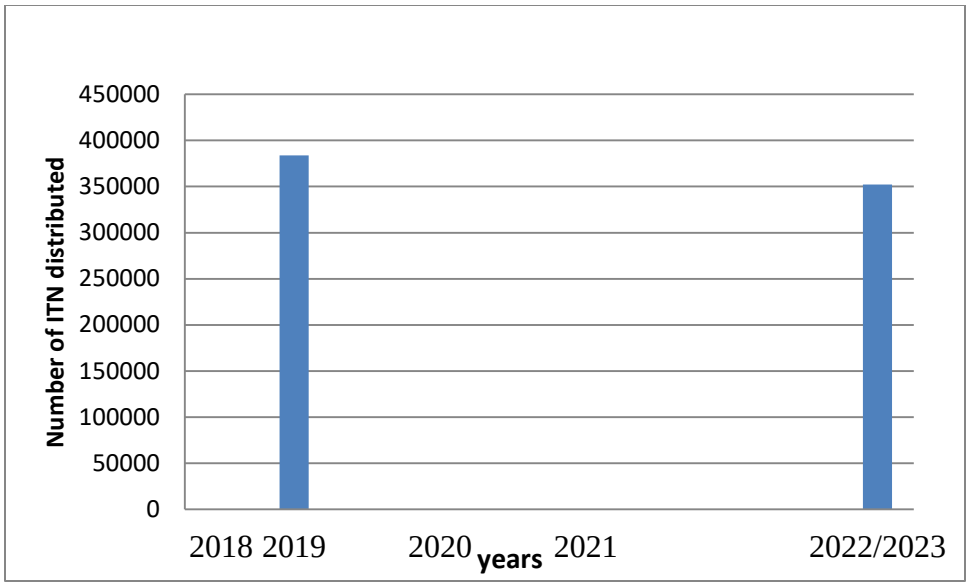

Figure 12 ITN distributions in the past 5 years: Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, 2022.

5.5.2. ITNs utilization

An Assessment was done at the end of 2022 GC for insecticide threatened net availability and utilization at household level, and the result shows most of the people were not used the net at least for recommended period of time that is for three to Five years(Figure13).

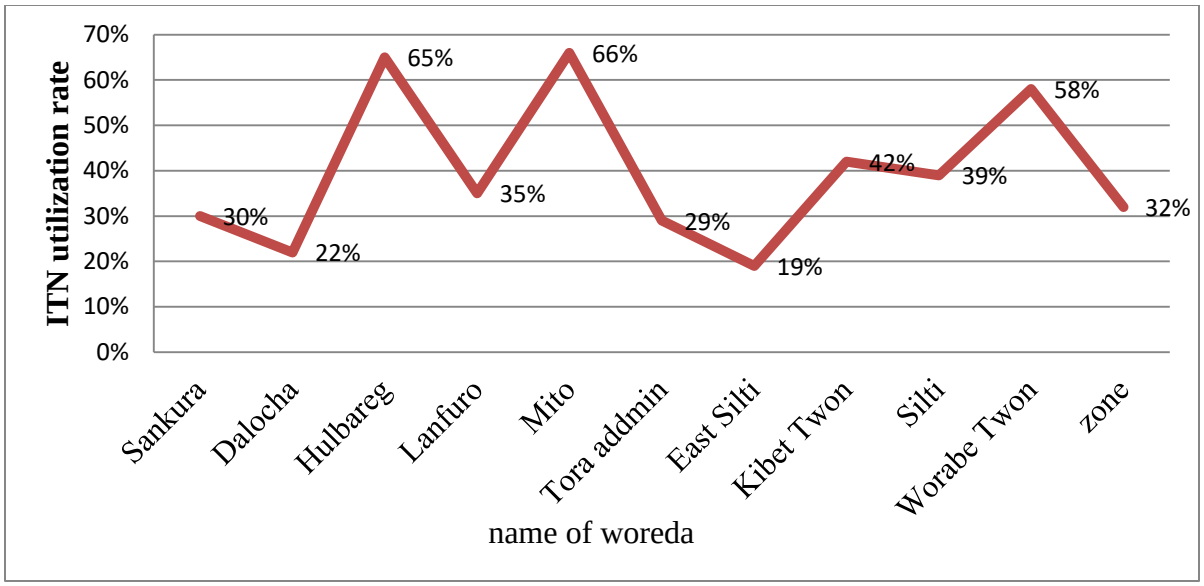

Figure 13 Trend of ITN utilization and availability in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, 2022.

5.5.3. Indoor Residual Spray (IRS)

Indoor residual spray is one of the malaria control and prevention mechanisms that is experienced in most malarious areas year to year (Table 6).

Table 5: Indoor Residual Spray by wereda, in Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, 2022.

s.no	Wereda	Number of kebele	Number of population protected	HHs	Unit structure	Coverage
1	Hulbareg	1	10,661	2176	3,940	97%
2	East Silti	2	3851	786	1179	98%
3	Sankura	24	60140	12273	20384	93%
4	Werabe	2	1825	372	597	93%
5	Dalocha	7	25007	5103	11791	91%
	Zone	36	101484	20710	37991	94%

6. Discussion

In this study, the overall clinical and confirmed estimated mean annual malaria prevalence rate was 10.14 per 1000 population at risk per year in the five years prior to the study. It was lower than the prevalence rate compared to the annually Southern Nations, Nationalities, and Peoples Region (SNNPR) (16.17%), followed by Oromia Regional State (13.11%) and Amhara Regional State (9), but higher than the rate from EMIS 2015, Gambella (6%) and Benshangul Gumuz (3%) region (4), malaria surveillance data analysis in Ethiopia(9), and Butajira district (23).

The elevated rates observed in the siltE zone may be attributed to variations in geographic and climatic factors. Over the past five years, the average annual prevalence rates of malaria in the districts were notably high in Dalocha and Sankura Woreda, while they were comparatively low in Alicho Wuriro Woreda and Misrak Azernet Berbere Wereda. The remaining districts exhibited moderate prevalence rates, as indicated by the National Malaria Strategic Plan 2014–2020 (12). The maximum number of malaria cases in 2021-2022 could be due to the inconsistent implementation of malaria prevention and control strategies and the rise of COVID-19 in the study area. The radical decline in 2018-2019 may indicate that there was collective action by stakeholders to raise awareness, increase budgets, and implement malaria prevention and control strategies. The average yearly inpatient malaria cases and fatality rates were lower than those found in Ethiopian malaria monitoring data (9). This could improve the early detection and treatment of malaria control and prevention methods. In this study, the predominant reported species was *P. falciparum* 22064 (60%), followed by 14555 (40%) were P. vivax. This was a study conducted in Ethiopia P. falciparum (60%), *P. vivax* (40%) (7) hadiya zone and (12)and butajera (28).

The dominance of *Plasmodium species* was not constant over the years, although a consistent increase in trends from 2019 to 2022 was observed for Plasmodium falciparum. This could be due to the consistency of malaria prevention methods in the areas and increasing behavior towards drug resistance. In the study area, the number of malaria cases that peaked was similar to that in Ethiopia. In many parts of Ethiopia, the peak transmission season is due to the heavy rains from June to September, which create a suitable environment for Anopheles mosquitoes to reproduce. The Little Transmission Period is the result of a small rain shower from February to March. Although transmission of malaria is usually associated with rainy seasons, malaria cases in the present study were similar in season (6) above as well. This study shows that malaria cases were more frequently male (54.2%) than female (45.8%). Since most of the population income depends on agriculture, people are mainly engaged in agricultural activities and other large projects. They could spend

the night with their possessions and farm produce. This can leave them easily exposed to malaria vectors. Regarding the distribution of the estimated annual malaria prevalence rate by age group over the past five years, the majority of reported cases were in the age group <5 years, in contrast to the study conducted in the Wolaita zone. Southern Ethiopia(11). The mean annual test positivity rate (microscopic and RDT) in Silte Zone was the highest (36.12%) compared to the study conducted in Wolaita Zone, Southern Ethiopia (11), in Hadiya Zone (12) and in Bata District, Equatorial Guinea (8). Of the total confirmed malaria cases, the most commonly reported species was P. falciparum, in line with the national malaria guideline(27), the 2014/2015 health-related indicator (4), the malaria surveillance data analysis (7), and the study conducted in the Wolaita zone (11). However, this is in contrast to the study conducted in Hadiya zone(12) and Butajira district in central Ethiopia (28).

The annual prevalence rate of malaria cases varies every year. The highest malaria prevalence rate was observed in 2021/2022, which climbed fourfold compared to 2019/2020, while the lowest was recorded in 2018/2019, which nearly tripled compared to 2021/2022. In 2021/2022, confirmed malaria cases increased somewhat as compared to 2018/2020. Overall, there has been an intermittent trend in confirmed community malaria over time. There was no noticeable decrease in the number of confirmed malaria cases in outpatients. However, the number of clinical malaria cases, hospitalisations, and deaths in the Silte zone has occasionally approached zero.

A trend of significant sharp increases in malaria cases has been observed over the years, this finding indicating that the Zone has failed to meet both global and national goals of reducing malaria and accelerating progress towards elimination. Achieving the goal requires access to care for suspected cases of malaria and adequate diagnostic testing and therapeutic management at all points of care, to ensure that all patients with malaria receive prompt and effective treatment, and to ensure the availability and use of long-acting insecticides Nets(LLINs) as well as the implementation of Indoor Residual Spraying (IRS) are powerful vector control tolls to reduce malaria transmission. Improving the malaria detection and speciation skills of laboratory personnel and expanding other malaria control and prevention activities are very important to greatly reduce the burden of malaria in the study area (27).

Even if there is a good strategy for tracking and treating cases, environmental control activities such as insecticides are threatening net use. Indoor residual spray, larvae source management for malaria prevention and control, the performance of these activities in the zone was not good enough to prevent as well as malaria elimination. Long-lasting insecticide nets remain an important vector control intervention to influence

malaria transmission. The standard ITNs mentioned in the national guidelines should be distributed nationally every three years, twice in a period of five years. Overall Silte zone coverage was 94%, which is below expectations. Nationwide coverage with 100% ITN distribution was planned(27).

Sankura Woreda is the area with the highest rate of malaria cases. The results show that the ITN distribution and IRS spray were 100%, but the ITN utilization was very poor (30%). The zonal ITN utilization was 32%, which is very low according to the national plan to ensure high utilization (>85%) (5) and can make a major contribution to the prevalence of malaria cases. Indoor residual spray plays an important role in targeted disruption of malaria transmission areas. The goal of IRS is to rapidly reduce the malaria burden in areas with high transmission rates and to ensure zero transmission in areas where the malaria burden has been reduced. In two major malaria areas, Sankura Wereda (93%) and Dalocha Wereda (91%), indoor residual sprays were conducted in the past years and zonal to 97% of sprayed unit structures, but IRS coverage of at least 85% of target structures is on planned at national level (27).

Malaria cases are anticipated to be exceedingly uncommon owing to the comprehensive implementation of indoor residual spraying and the distribution of insecticide-treated nets. Nevertheless, despite achieving 94% coverage with indoor residual spraying and 100% coverage with insecticide-treated nets, there has been a significant increase in malaria cases.

7. Limitations of the study

- Malaria incidence may be overestimated due to insufficient secondary surveillance data, which only includes cases reported by healthcare personnel. This may not represent all malaria cases in the community. Secondary data information can be erroneous, confined to a few variables, or incomplete.
- Validating malaria control and preventive strategies in the community, such as LLIN utilisation rate and IRS spray status, has proven challenging.

8. Conclusions

The zonal malaria burden has increased over the past three years, with a notable increase in confirmed community cases. However, clinical malaria cases, hospitalizations, and fatalities occasionally approach zero. Early diagnosis and prompt treatment have reduced inpatient malaria cases and mortality rates. Challenges remain in broadening malaria-related interventions, including long-lasting insecticidal nets and indoor residual spraying. Enhancing intervention strategies and surveillance efforts is crucial for alleviating the disease burden.

9. Recommendation

- Surveillance data currently lacks critical personal characteristics.
- It is essential to strengthen prevention and control initiatives, especially targeting the Silte Zone.
- There is a need to enhance community health education on the proper use of long-lasting insecticide-treated nets.
- Additional evaluations or operational research should be conducted to assess the effectiveness of long-lasting insecticide-treated nets (LLINs) and indoor residual spraying (IRS) in controlling and preventing malaria.
- The zonal health department is responsible for monitoring and documenting the usage of LLINs.
- The health department should expand malaria-related interventions, strengthen health systems, and make substantial efforts to reduce the impact of malaria.
- The government and relevant organizations need to work together to reduce malaria prevalence in the zone, with the goal of achieving malaria elimination.

Referances

1. Organisation WH. World malaria report 2021 [Internet] [Internet]. World Health Organization. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

2. WHO. Word Malaria Report 2021 [Internet]. Word Malaria report Geneva: World Health Organization. (2021). Licence: CC BY-NC-SA 3.0 IGO. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

3. Badmos AO, Alaran AJ, Adebisi YA, Bouaddi O, Onibon Z, Dada A, et al. What sub-Saharan African countries can learn from malaria elimination in China. Trop Med Health [Internet]. 2021;49(1). Available from: https://doi.org/10.1186/s41182-021-00379-z

4. Anekwe T, Barofsky J, Farzadfar F, Chase C. The economic effects of malaria eradication: Evidence from an intervention in Uganda. Progr Glob Demogr Aging. 2011;(70).

5. Krief S, Escalante AA, Pacheco MA, Mugisha L, André C, Halbwax M, et al. On the diversity of malaria parasites in African apes and the origin of Plasmodium falciparum from bonobos. PLoS Pathog. 2010;6(2).

6. Mace KE, Lucchi NW, Tan KR. Malaria Surveillance — United States, 2017. MMWR Surveill Summ. 2021;70(2):1–35.

7. World malaria report 2018. 2018.

8. Legesse Y, Tegegn A, Belachew T, Tushune K. Knowledge, Attitude and Practice about Malaria Transmission and Its Preventive Measures among Households in Urban Areas of Assosa Zone, Western Ethiopia. Ethiop J Heal Dev. 2007;21(2):1–9.

9. kitaw TA, Haile RN. Prevalence of polypharmacy among older adults in Ethiopia: a systematic review and meta-analysis. Sci Rep. 2023;13(1).

10. Indicator M. Cover photo: Ashenafi Assefa. 2016;

11. FMOH. NATIONAL MALARIA GUIDELINES, Third Edition. Ministry of Health of Federal Democratic Republic of Ethiopia. Addis Ababa,Ethiopia. 2012;(January):54–7.

12. FMOH. National Malaria Control Program Monitoring and Evaluation Plan 2014-2020. Draft v14 [Internet]. 2014;(June):1–43. Available from: papers2://publication/uuid/5F7F5ACD-D77C-4B46-AE26-40712DCC111C

13. Ababa A. Diagnosis and Treatment Guidelines for Health Workers in Ethiopia 2nd Edition. Heal (San Fr. 2004;(July).

14. Organização Mundial da Saúde. Guidelines for Malaria Vector Control [Internet]. Guidelines for Malaria Vector Control. 2019. 161 p. Available from: http://www.ncbi.nlm.nih.gov/pubmed/30844152

15. Access O, National H, State R. Open Access. 2015;8688:1–9.

16. World malaria report 2022 World malaria report 2022. 2022.

17. WHO. World malaria World malaria report report [Internet]. 2023. 283 p. Available from: https://www.wipo.int/amc/en/mediation/%0Ahttps://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023

18. Duguma T, Tekalign E, Kebede SS. Tadesse Duguma*, Eyob Tekalign, Samuel Sahile Kebede and Getachew Mes fi n Bambo. 2023;(October):1–10.

19. WHO GS. World malaria report, 2013. 2014;

20. Girum T, Shumbej T, Shewangizaw M. Burden of malaria in Ethiopia , 2000-2016 : findings from the Global Health Estimates. 2019;5–11.

21. Ncogo P, Herrador Z, Romay-Barja M, García-Carrasco E, Nseng G, Berzosa P, et al. Malaria prevalence in Bata district, Equatorial Guinea: A cross-sectional study. Malar J. 2015;14(1):1–10.

22. Jima D, Wondabeku M, Alemu A, Teferra A, Awel N, Deressa W, et al. Analysis of malaria surveillance data in Ethiopia: What can be learned from the Integrated Disease Surveillance and Response System? Malar J. 2012;11:1–14.

23. Access O. Prevalence of malaria infection in Butajira area ,. 2012;1–8.

24. Legesse D, Haji Y, Abreha S. Trend Analysis of Malaria Occurrence in Wolaita Zone, Southern Ethiopia: Retrospective Cross-Sectional Study. Malar Res Treat. 2015;2015.

25. Delil RK, Dileba TK, Habtu YA, Gone TF, Leta TJ. Magnitude of malaria and factors among febrile cases in low transmission areas of Hadiya Zone, Ethiopia: A facility based cross sectional study. PLoS One. 2016;11(5):1–17.

26. EPHI. GUIDELINE Federal Democratic Republic of Ethiopia Public Health Emergency Management (PHEM) Guideline for Ethiopia. 2022;

27. FMOH. National Malaria Guidelines, Fourth edition. Natl Malar Giuideline. 2017;3rd(November):1–108.

28. Woyessa A, Deressa W, Ali A, Lindtjørn B. Malaria risk factors in Butajira area , south-central Ethiopia : a multilevel analysis. 2013;1–10.

Chapter III: Evaluation of Surveillance System

3. Evaluation of the Malaria Surveillance System in Hulbareg Woreda, Silte Zone, Southern Nations, Nationalities, and People's Region, Ethiopia, 2023.

Executive Summary

Introduction: Surveillance is the systematic gathering, analysis, interpretation, and distribution of health-related information to enhance public health responses and promote overall health. In malaria, surveillance is crucial for evaluating incidence and trends, stratifying control efforts, and implementing interventions. However, in Ethiopia, the Silte Zone Hulbareg woreda lacks a prior evaluation of its surveillance system, leaving its strengths and weaknesses unknown.

Objectives: To describe the existing malaria surveillance system attributes done efficiently and effectively in Silte Zone Hulbareg Woreda, Southern Nation Nationalities Region. 2022

Methodology: We conducted descriptive cross-sectional study from Marc 11 – March 22/ 2023. Information on system attributes were collected from a woreda health office, four health centers and four health posts by using standard WHO and CDC standard checklist for surveillance system and data collection. The data collected has been analyzed using Microsoft Excel 2010.

Result: Healthcare institutions acknowledged the importance of surveillance systems in detecting outbreaks, evaluating morbidity and mortality rates, and assessing prevention and control measures. Reporting formats were flexible, and malaria case definitions were clear. However, data analysis was not location or demographic-based, hindering effective intervention strategies. Only 36% of health facilities adhered to national Public Health Emergency Management policies, and a multi-sectoral committee was not operational.

Conclusion& Recommendation: The system evaluation identified deficiencies in the district surveillance system, including inadequate monitoring, feedback mechanisms, budget allocation for PHEM activities, logistical and training issues, water and power supply challenges, and ineffective data management. The Woreda Health Office should prioritize PHEM activities.

1. Introduction

1.1. Background

Public health surveillance involves the continuous and systematic gathering, analysis, interpretation, and distribution of data concerning health-related events. This process is essential for informing public health initiatives aimed at decreasing morbidity and mortality rates while enhancing overall health outcomes (1,2). Information provided by a public health surveillance system can be utilized for prompt public health interventions, as well as for the planning and assessment of programs (2). Early detection of illnesses is crucial as it signals the onset of an epidemic, allowing for timely and effective responses. This enhances health treatment planning, execution, and evaluation, while also contributing to a better understanding of epidemiological trends (3).

The infectious disease surveillance system plays a vital role in providing early public health alerts and monitoring specific diseases, thereby ensuring health security at national, regional, and global levels. It tracks disease trends, evaluates the progress of disease control measures, and supplies essential data for assessing the effectiveness of prevention and control strategies (1). The objective of assessing public health surveillance systems is to guarantee that matters of public health significance are tracked in an efficient and effective manner (2).

In Ethiopia, a total of 36 diseases have been designated for routine surveillance, with 22 requiring immediate reporting and 14 reported on a weekly basis. Among these, malaria is classified as a nationally reportable disease (4).

Malaria surveillance has emerged as an essential component of all malaria initiatives (5). Routine malaria surveillance data is particularly valuable for evaluating incidence and trends over time, as well as for stratifying malaria control efforts (6). The prompt and accurate provision of malaria surveillance data is essential for effectively pursuing malaria control and elimination, as well as for enabling the strategic implementation of interventions (7,8). The effectiveness of malaria surveillance systems in delivering precise data regarding the transmission and development of malaria differs significantly across the globe It is affected by several factors, including the degree to which patients pursue treatment, the utilization of public health facilities

by patients, the percentage of patients undergoing diagnostic testing, and the thoroughness of recording and reporting systems (9).

Enhanced malaria surveillance enables health ministries to pinpoint affected regions, monitor disease trends, and create effective interventions. This capability allows countries to assess the success of their control efforts more effectively (10).

Malaria stands as the primary contributor to illness and death on a global scale, continuing to pose a significant threat to health, as well as to social and economic progress (11,12). The most recent World Malaria Report indicates that in 2021, there were 247 million reported cases of malaria, an increase from 245 million cases in 2020 (13). The estimated number of deaths from malaria was 619,000 in 2021, compared to 625,000 in 2020. In the past two years, the number of malaria cases worldwide has increased by 14 million cases and deaths from disruptions by 47,000 during the coronavirus pandemic (13).

Malaria is identified as the foremost communicable disease in Ethiopia, responsible for nearly 30% of the total years of life lost due to disability (14). Around 75% of Ethiopia's territory is affected by malaria, with the prevalence of the disease largely linked to factors such as altitude and rainfall (14,15), Approximately 68% of the overall population resides in regions susceptible to malaria (14,16,17). In Ethiopia, there are four principal eco-epidemiological layers that facilitate malaria transmission (1). Regions that are free from malaria are located at elevations exceeding 2,500 meters; 2) the highland peripheries, situated between 1,500 and 2,500 meters, experience recurrent epidemics; 3) lowland regions, which lie below 1,500 meters, exhibit seasonal transmission patterns; and 4) areas with stable malaria transmission, characterized by year-round prevalence, are confined to the western lowlands and river basins (18).

Plasmodium falciparum and *Plasmodium vivax* are the main malaria parasites, responsible for 60%-70% and 30%-40% of cases, respectively. Clinical malaria contributes to 10%-40% of outpatient consultations.(16). To reduce the morbidity and mortality associated with malaria in Ethiopia, a comprehensive strategy has been implemented. This approach includes vector control, early diagnosis, prompt treatment, surveillance, and the prevention and rapid response to malaria epidemics. These initiatives have been part of the country's health sector development program since 1999 (19).

Hulbareg Woreda, located in the Silte Zone of the Southern Nations and Nationalities Peoples Region (SNNPR), is identified as one of the main malaria hotspots in the country. As a result, this assessment was conducted to evaluate the strengths, weaknesses, and objectives of the surveillance system in this area.

1.2. Rationale

Public health surveillance systems must undergo regular evaluations to ensure their effectiveness and efficiency. However, Hulbareg Woreda has not previously assessed its surveillance system, resulting in an unclear understanding of its strengths and weaknesses. To address this gap, we conducted an evaluation of the surveillance system in Woreda to assess its efficiency and effectiveness in identifying and responding to public health issues. This assessment aims to facilitate the implementation of strategies to address any identified shortcomings.

2. Objectives

2.1. General Objective

To describe the existing malaria surveillance system attributes done efficiently and effectively Silte Zone, in Hulbareg woreda Ethiopia, 2022

2.2. Specific Objectives

- To analyze the characteristics of the Woreda malaria surveillance system.
- To examine the effectiveness of the surveillance system in relation to the established objectives.
- To offer potential recommendations for enhancing the surveillance system.

3. Methods and materials

The study was conducted in the Southern Nations and Nationalities Peoples Region (SNNPR), specifically in the Silte Zone of Hulbareg Woreda. This Woreda is located approximately 230 kilometers southwest of Addis Ababa and 188 kilometers from the regional capital, Hawassa. It consists of 11 administrative kebeles, with ten classified as rural and one as urban. The target population for the study included the entire population of Hulbareg Woreda, totaling 98,869 individuals, comprising 48,446 males and 50,423 females, based on projections from the 2007 census data for 2022. Notably, around 96% (94,513) of the residents live in rural areas, while the

remaining 4.4% (4,356) reside in urban settings.

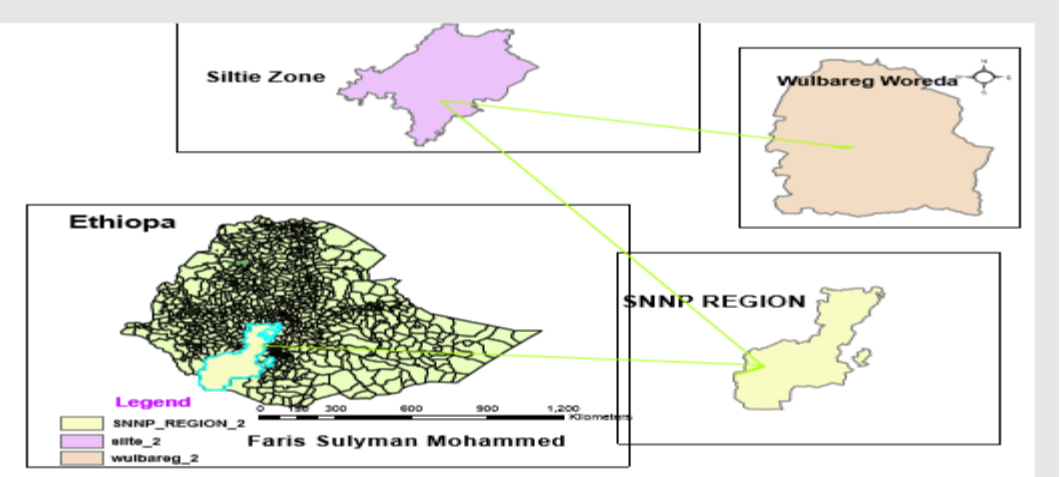

Figure 14: Map of Hulbareg Woreda, located within Silte Zone, Southern Nation Nationalities of Peoples Region, Ethiopia, 2023.

3.1. **Study Design and Period**

A descriptive cross-sectional study was conducted from March 11 to March 22, 2023.

3.2. **Sample Size, Sampling Technique, and Study Units**

The Woreda was intentionally selected based on its high malaria case burden relative to other Woredas in the Zone. A convenience sampling method was used to choose the health facilities for the study. The research focused on the Woreda health offices and health facilities as study units, incorporating a total of eight sites: four governmental health centers and four health posts, along with the Woreda health office. The specific health centers included Hulbareg Health Centre, Amberico Gimba Health Centre, and Bilewanija Demeke Health Centre. The health posts were aligned with their respective health center catchment areas: Bilewanija, Gimba, and Wacho-Obiso Health Posts.

3.3. Data Collection and Analysis

Data collection was carried out using a semi-structured questionnaire and an observation checklist. Surveillance officers and personnel from health institutions were interviewed with these tools. Additionally, secondary data sources were reviewed, which included the completeness and timeliness of surveillance reports, malaria surveillance data, supervision reports, written feedback, preparedness plans, and malaria monitoring charts. Information about

the system attributes was gathered following the CDC surveillance system evaluation guidelines. The data collected from the questionnaires was then digitized and analyzed using Microsoft Office Excel 2010.

3.4. Ethical Clearance

An endorsement letter was obtained from the Silte Zone Health Department and distributed to the relevant health offices, health centers, and health posts to ensure their cooperation in the study.

3.5. **Operational definitions**

Simplicity: This refers to the system's design and how easy it is to operate. (20).

Flexibility: This refers to the system's capacity to adjust to evolving information needs and operational conditions with minimal extra cost (20).

Data quality: This refers to the completeness and accuracy of the data collected by the system, ensuring it is both valid and reliable for analysis (20).

Acceptability: This refers to the extent to which individuals and organizations are willing to engage with the system, including those who operate it, report disease cases, or utilize the collected data (20).

Sensitivity: This refers to the proportion of actual disease cases identified by the surveillance system, as well as the system's ability to track changes in case numbers over time, including the detection of outbreaks (20).

Predictive value positive: This refers to the proportion of reported cases in the surveillance system that are accurately diagnosed as true instances of the disease being monitored(20).

Representativeness: Is the ability of the system to accurately describe the occurrence of a health related event by place and person over time in a given population (20).

Specificity: refers to the proportion of persons without the disease that are considered by the surveillance system as not having the disease (20).

Reliability: his refers to the extent to which the results obtained from a measurement or procedure can be consistently replicated under similar conditions.

Timeliness: This refers to the system's capability to prompt appropriate actions promptly, ensuring that responses to health events occur within a critical timeframe (20).

Stability: his term refers to the reliability of the public health surveillance system, encompassing its capacity to collect, manage, and deliver data accurately without failure. It also highlights the system's availability, ensuring it is operational and accessible when needed for effective public health monitoring and response (20).

Usefulness: This term refers to the relevance of the surveillance system in providing actionable information that supports decision-making, guiding interventions, and enhancing public health outcomes. A useful system effectively translates data into meaningful insights that can inform strategies and responses to health issues (20).

Completeness: This refers to the proportion of all expected data reports that have been submitted to the public health surveillance system. High completeness ensures that the data collected accurately reflects the health situation, allowing for more effective monitoring and response to public health issues (20).

4. Results

4.1. Assessment of Surveillance Documentation, Registers and Forms Availability

In the assessment of eight health facilities, only two (25%) possessed the national Public Health Emergency Management (PHEM) guideline, while the remaining seven facilities—including two health centers and five health posts—did not have access to this guideline. Over the past six months, only the Woreda Health Department provided essential reporting formats, which included the case investigation form, line list, weekly reporting format, and daily epidemic reporting format.

All health facilities and departments displayed case definitions for diseases targeted for eradication and elimination, specifically for measles, acute flaccid paralysis (AFP)/polio, and neonatal tetanus (NNT). Among the sites visited, four health posts did not have established standard guidelines for diagnosing and treating malaria, nor for preventing and controlling malaria epidemics. Furthermore, only one rumor logbook was maintained at the Woreda level, highlighting a gap in systematic documentation and response to potential public health threats.

This assessment underscores the need for improved documentation practices and the dissemination of comprehensive guidelines to enhance the effectiveness of the surveillance system.

Case Detection

All health facilities assessed had a standardized case definition for malaria, and staff comprehension of this definition was generally satisfactory, as evidenced by the knowledge demonstrated by several health professionals present during the visits. However, two health posts lacked this case definition, relying instead on the malaria module provided during their training for case detection.

Health professionals were effective in identifying all suspected malaria cases according to the established case definition. Laboratory tests were conducted using microscopes at the health center level, while rapid diagnostic tests (RDT) were employed at the health post level. Despite

this, health workers across all visited health stations expressed concerns about the reliability and effectiveness of the RDTs used for malaria diagnosis.

These findings highlight the importance of consistent access to standardized guidelines and the need to addressing the concerns raised by health workers regarding diagnostic tools.

Case Registration

All visited health facilities maintained standardized registers for documenting essential malaria data. Each health center accurately recorded case information using these registers. However, it was noted that the data collected were not subjected to analysis, which limits the potential for identifying trends and informing effective interventions. Implementing a systematic approach to data analysis could enhance the utility of the recorded information and improve malaria management efforts in the region.

Case Confirmation

When suspected malaria cases were reported at health facilities, health workers collected blood samples for laboratory testing. Microscopy was utilized for diagnosis at the health center level, while rapid diagnostic tests (RDT) were employed at the health post level. This dual approach helps ensure accurate case confirmation and timely treatment for affected individuals.

Reporting

The health facilities visited reported a 100% weekly reporting rate over the 12 weeks leading up to the assessment, with overall reporting rates to the Regional Health Bureau in 2023 also at 100%. Reports were transmitted through various means, including paper, telephone, and electronic methods. Health posts communicated reports to health centers using paper and phone, while health centers forwarded information to the Woreda health office using similar methods. The Woreda health office then relayed this data to the Regional Health Bureau via paper, phone calls, fax, and the electronic database e_IDSR.

However, health posts without telephone services face significant challenges in reporting. Health Extension Workers (HEWs) often use their personal mobile phones to report, incurring their own costs, and they have raised concerns about the lack of reimbursement for these expenses.

The reporting schedule is structured as follows: health posts submit reports to health centers every Monday afternoon, and the Woreda health office sends reports to the Regional Health Bureau every Tuesday afternoon.

Training

All contact persons from the four health centers confirmed that every member of the surveillance units has undergone short-term training or workshops lasting between 2 to 5 days, organized by the regional health agency and WHO. However, personnel assigned to the Woreda Health Office's PHEM Works Core Process did not receive training specific to their roles. Additionally, service providers and health extension workers at the facility level have received orientation on relevant topics.

Data Analyses

In each health office and facility evaluated, a designated individual was responsible for data analysis. At the health facility level, data analysis was performed quarterly by Public Health Emergency Management (PHEM) officers, health professionals, and health extension workers at health posts. This analysis primarily served reporting purposes to address inquiries from higher authorities.

However, the analysis was found to be incomplete. It focused solely on time-related data, neglecting important aspects such as location and individual identifiers. Additionally, the malaria epidemic surveillance table was not utilized at any level of the health station. Instead, the information collected was used to monitor the epidemic threshold by simply doubling the cases from the previous year, without considering the third quartile of five-year morbidity data. This approach limits the effectiveness of the surveillance system in identifying trends and responding to outbreaks.

4.2. Epidemic Preparedness and Response

The Woreda health office has developed a plan for epidemic preparedness and response; however, none of the visited health centers or health posts had implemented this plan. Although the Woreda health office has indicated the need for a budget for emergencies, the funds allocated are less than 1% of the proposed budget. While the Woreda is prepared to mobilize funds for response activities in the event of an emergency, the necessary drugs for epidemic response are currently unavailable. The health office has assured that the region will supply these drugs as needed.

All assessed health facilities have established rapid response teams and emergency/epidemic management committees. However, despite the existence of meeting minutes for the epidemic management committee, it is evident that regular meetings do not take place; these committees are activated only in response to specific events.

In the past six months, there have been no reported malaria outbreaks. Additionally, no dedicated vehicles are designated for emergency response; emergencies are instead addressed by incorporating them into other ongoing activities. At both the Woreda health office and the visited health centers, a malaria monitoring chart is consistently updated to track the trend of malaria cases, which aids in the early detection of potential epidemics. However, while the monitoring chart's implementation is more practical at the health post level, it is not consistently updated or utilized for case monitoring across all health posts.

4.3. Feedback and supervision

Feedback is critical for surveillance systems and encouraging employees. Woreda professionals provide both verbal and written criticism, incorporating supportive supervision from other departments. Regular supportive supervision is offered quarterly, with written input provided monthly and biweekly. However, inconsistencies and documentation errors have been identified, and written feedback was found to be incomplete in all inspected health facilities.

4.4. Attributes of the Surveillance System

The malaria surveillance system implemented across the evaluated health institutions effectively assessed the extent of the disease, facilitating informed planning and intervention strategies. Trend analysis of malaria cases was conducted at the Woreda health office and health centers primarily to identify potential epidemics. This analysis included weekly counts of malaria cases and established epidemic thresholds, which were prominently displayed at the relevant health facilities to aid in monitoring.

However, during the assessment, it was noted that the visited health posts did not consistently maintain their monitoring charts. This lack of adherence hindered their ability to identify potential epidemics, indicating a gap in the overall effectiveness of the surveillance system at the health post level. Strengthening the monitoring practices at these sites is crucial for timely detection and response to malaria outbreaks (Figure 15).

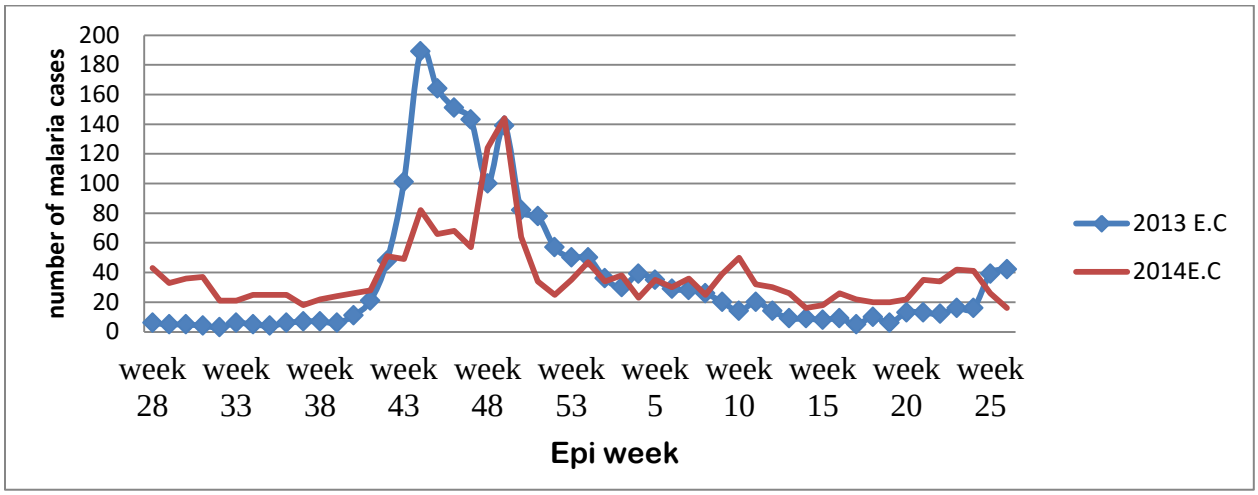

Figure 15: Confirmed malaria cases in Hulbareg Woreda by epidemiological week, comparing the years 2021 and 2022.

Simplicity: Malaria case definitions at health facilities are simple and understandable, with two categories: community and standard. Both are provided in Amharic and local dialects, making them easily accessible to everyone. These definitions are used by health workers since they are simple to understand and can be completed in less than 14 minutes. The procedure entails sending notifications upon diagnosis and exchanging data via a predetermined pathway.

Flexibility: The currently available reporting forms for malaria surveillance were noted to be highly adaptable, allowing health facilities to efficiently report and accommodate newly occurring health events. These forms are designed to be simple yet comprehensive, facilitating accurate recording and reporting of relevant data. This flexibility is essential for responding to emerging public health challenges and ensuring that the surveillance system remains responsive to the evolving needs of the community. Enhancing this adaptability further can improve the overall efficiency of the malaria surveillance efforts in the region.

Acceptability: The acceptability of the malaria surveillance system was assessed through the active participation and engagement of reporting employees in case identification and reporting. The involvement of reporting agents was notably high, with a 100% reporting rate from all health facilities over the previous 12 weeks. Moreover, all health facilities acknowledged the surveillance system's significant utility in detecting outbreaks, assessing the magnitude of morbidity and mortality, and evaluating the effectiveness of prevention and control programs. This strong level of engagement underscores the system's relevance and importance to the health workforce, enhancing its overall effectiveness in managing malaria cases in the region.

Representativeness: The representativeness of the surveillance system was evaluated based on health service coverage and the population's health-seeking behavior regarding the disease. Within the district, every rural Kebele is equipped with operational health posts (7), and there are 4 health centers, ensuring a health service coverage rate of 100%. Malaria is prevalent in the district, and the community demonstrates a proactive approach to seeking treatment for this illness. The surveillance system is designed to identify all public health emergencies within the community, irrespective of age, gender, religion, ethnicity, or other social and economic factors. Nevertheless, the weekly reporting formats are deficient in several critical variables, such as age, gender, and other potential risk factors. This contrasts with the Health Management Information System (HMIS) reporting formats and omits essential epidemiological data necessary for effective analysis and informed decision-making in response to emerging health needs.

Sensitivity: the sensitivity of a surveillance system pertains to its capacity to identify actual cases within a population and communicate these findings through the system. All healthcare facilities have indicated that the current case definitions, especially for malaria, are clearly articulated and effectively capture every malaria case. The community-based case definition is

particularly beneficial for health extension workers and the health development army, enabling them to promptly identify and report all suspected malaria cases and other notifiable priority diseases at the community level. The sensitivity regarding the detection of events for public health response is defined as the ratio of cases identified and reported through the system. However, this measurement remains elusive, as the total number of individuals afflicted with the disease in the community has not been determined.

Predictive Value Positive: The positive predictive value is difficult to assess because the total number of people who have the condition has not been identified.

Timeliness: The single most important measure of timeliness is whether data are reported in time to begin investigations and implement control measures. Thus, timeliness of reporting was measured according to the PHEM guideline i.e., the percentage of the total sites reporting on time divided by the total sites expected to report. The surveillance report timeliness of the district was 95%. Since the primary objective of surveillance is to take an action, late reports are less important for Public health emergency management.

Completeness: The completeness of the Woreda surveillance report was recorded at 100%.

Stability: All healthcare facilities responded that any reorganization had an impact on surveillance activities, which required different capacity building. High staff turnover and lack of resources have hampered monitoring activities. When trained surveillance personnel left the position, there were difficulties in data collection and reporting. Because untrained employees did not volunteer to fill the vacancy as the system does not offer other types of incentives, such as training.

5. Discussion

Our goal was to assess Hulbareg Woreda's surveillance system by explaining it and analyzing its utility, simplicity, data quality, acceptability, representativeness, timeliness, and stability for the chosen disease, malaria. Surveillance is the systematic gathering, analysis, and interpretation of health-related information. This data is used to track health conditions and take public health action. The major goal of the monitoring system is to discover outbreaks before they cause harm to the public, as stated.

The report completeness rate is one of the measurements used to establish wether the monitoring system is effective or not. As a result, the weekly surveillance report's completeness is consistent with WHO's aim (100%), indicating that all health centers and health posts visited report in by the national guideline norm at their respective levels.

The result shows that 95% of Woreda reporting was completed on schedule, which is higher than the national target. This is a key sign for identifying problems early on and responding to them quickly and efficiently. Timely reports give information that aids in the prediction of future outbreaks, trends in disease incidence, cases requiring further investigation, future implications of disease surveillance, and actions to address timely discovered issues. The issue of data quality, particularly at the health post level, has been identified as doubtful and requires improvement.

The analysis and interpretation of public health surveillance data serve as a link between the design and operation of a surveillance system and the use of the system's data to implement public health measures and disease control programs. Surveillance data is used to detect epidemics, formulate hypotheses, describe disease or injury trends, assess prevention programs, and estimate future public health requirements.

In general, the analysis and interpretation of surveillance data should be prioritized over the time-consuming difficulties of gathering, organizing, and storing surveillance data. As a result, analysis should be undertaken as part of a normal monitoring programs, allowing findings to be tracked over time (21). As a result, data analysis and monitoring of malaria trends were only noticed over time at the district level. However, all data collected by the monitoring system should be analyzed on a regularly, by time, location, and person.
The data analysis by place reveals where the outbreak/cluster of cases occurred and offers

information on its geographic scope as well as suggestions for implementing interventions in the impacted area, while the data analysis by person shows which population group is more affected and should be prioritized for interventions. The information gathered at the healthcare facilities analyzed was not interpreted by location or person, particularly at the health post and health center levels.

On the other hand, the Emergency Preparedness and Response Plan, which identifies all potential public health threats in the woreda, the resources required, the gaps that must be filled, and the potential contributors, is critical and the first step before any health-related event. This allowed epidemics to be forecast and contained in a timely manner, preventing significant damage. The goal of preparedness is to improve the ability to recognize and respond to public health emergencies by conducting regular risk identification and analysis, forming partnerships and collaborations, increasing community participation, and engaging in community-based interventions and strategic communication during the pre-emergency phase monitoring and assessment (4). In the area visited, the Woreda Health Department has an Emergency Preparedness and Response Plan that was not supported with the necessary budget to respond in the event of an emergency, but the rest of the health facilities have not prepared this Emergency Preparedness Response Plan.

The fundamental step of preparedness at each level is to form a multi-sectoral epidemic control committee and a raped response team at each level (4). Furthermore, the created committee should be aligned or trained in pandemic preparedness and response. The multi-sectoral epidemic response committee should monthly basis, and the RRT will meet as needed during an outbreak.

Although a multi-sectoral epidemic committee has been constituted in the sites visited, it lacks effectiveness and holds regular monthly meetings at all levels. On the other side, when an outbreak occurred, a quick reaction team/technical committee was formed and met, as documented in the meeting minutes, however, the majority of the team members lacked epidemic preparation and response training.

The Woreda and health care facilities were evaluated, and oral and written criticism was provided to them. We took note of the written feedback letter. However, the feedback needs to

be improved so that it may be epidemiologically analyzed and interpreted for measurements including relevant factors. The turnover rate of district-level surveillance officers and health facilities is considerable, and persons with no training, no exposure to PHEM activities, and no medical background have been sent to the district level.

Capacity building is critical to the effectiveness of surveillance programmer. To increase the quality of illness detection and reporting, health workers' expertise needs to be updated and improved.

To enhance and stabilize a monitoring system, a dedicated supporting monitoring and feedback system is required. However, in most health care settings, supporting monitoring was not provided on a regularly.

6. Limitation of the Study

The lack of availability and completeness of data at the health facility level hinders the ability to observe trends. Additionally, challenges in obtaining permission from officials and designated personnel at offices and health centers have impacted our ability assess within the established timeline.

7. Conclusion

The surveillance system's overall performance in the evaluated district was deemed adequate for fulfilling the objectives of public health interventions; however, data analysis is deficiency concerning both location and individuals. At the Woreda level, the Emergency Preparedness and Response Plan (EPRP) remain incomplete and lack the necessary funding for effective rapid response. Furthermore, health institutions have not developed a plan nor engaged in the formulation of the Woreda EPRP. The report's timeliness and completeness received a commendable rating. However, there was no targeted supportive supervision conducted at the lower health facilities, particularly at health posts.

8. Recommendations

- Surveillance data must be examined in relation to location, individual characteristics, and temporal factors to inform public health interventions across all tiers.
- Regular training sessions and workshops focused on surveillance and related activities are essential due to the significant turnover of personnel in the woredas.
- The Public Health Emergency Management guideline ought to be disseminated to the healthcare facility.
- Regular and supportive supervision must be implemented at all tiers, particularly at the health post level, to enhance the quality of the surveillance system.
- Political leaders ought to engage actively in the implementation of the Extended Producer Responsibility Program, and ensure that adequate funding is allocated for emergency situations.
- Healthcare institutions ought to develop their own Emergency Preparedness and Response Plans (EPRP) and engage actively in the formulation of the Woreda EPRP.
- The epidemic preparedness plan, along with the assessment of capacities and resources, should be routinely updated, and financial provisions must be designated for emergency situations.
- It is essential to allocate funds for surveillance to guarantee the ongoing viability of the system.
- It is essential to designate suitable personnel for the PHEM section within the district health department, and to provide training for the current officer in this role.
- Rapid response teams and intersectoral committees should be coordinated and trained in epidemic preparedness and response, and they ought to convene on a regular basis.

References

1. WHO. Communicable disease surveillance and response systems. Guide to monitoring and evaluating. Epidemic and pandemic alert and response [Internet]. 2006;90. Available from: https://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_2/en/%0Ahttp://www.who.int/csr/resources/publications/surveillance/WHO_CDS_EPR_LYO_2006_2/en/

2. Services H. Inside : Continuing Education Examination Inside : Continuing Continuing Medical Education for U . S . U . S . Physicians and and Nurses Nurses Inside : Medical Education for for Evaluating Public Health Surveillance Systems Recommendations from the Guide. 2001;50(Cdc).

3. MSF. Clinical guidelines, diagnosis and treatment manual. 2013. 189–191 p.

4. Republic FD. Federal Democratic Republic of Ethiopia Public Health Emergency Management Guideline for Ethiopia Ethiopian Public Health Institute. 2022;(December).

5. Meat Industry Association. 2012 Annual Report. 2012;(July).

6. Jima D, Wondabeku M, Alemu A, Teferra A, Awel N, Deressa W, et al. Analysis of malaria surveillance data in Ethiopia: What can be learned from the Integrated Disease Surveillance and Response System? Malar J. 2012;11:1–14.

7. Moonen B, Cohen JM, Snow RW, Slutsker L, Drakeley C, Smith DL, et al. Operational strategies to achieve and maintain malaria elimination. Lancet (London, England). 2010 Nov;376(9752):1592–603.

8. Jima D, Getachew A, Bilak H, Steketee RW, Emerson PM, Graves PM, et al. Malaria indicator survey 2009, South Sudan; baseline results at household level. Malar J [Internet]. 2014;9(1):58. Available from: http://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-9-58

9. Cibulskis RE. Malaria surveillance systems: from control to elimination. Malar J. 2012;11(S1):2875.

10. News. 2024;2024.

11. Delhi N. Global Technical Strategy for Malaria Control and Elimination. 2016;(March 2013):13–6.

12. WHO_MAL_99.1087.pdf.

13. Organisation WH. World malaria report 2021 [Internet] [Internet]. World Health Organization. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

14. Indicator M. Cover photo: Ashenafi Assefa. 2016;

15. Malaria N, Team C. An Epidemiological Profile of Malaria in. 2014;(March).

16. Ababa A. National Malaria Guidelines. 2018;(March).

17. PRESIDENT ’ S MALARIA INITIATIVE MALARIA OPERATIONAL PLAN (MOP) ETHIOPIA FY 2010.

18. NATIONAL FIVE-YEAR STRATEGIC PLAN FOR MALARIA PREVENTION & CONTROL IN Addis Ababa April 2006. 2010;(April 2006).

19. Draft F. Federal Democratic Republic of Ethiopia Ministry of Health Health Sector Development Program IV October 2010 Contents. 2014;(October 2010).

20. Alemu T, Gutema H, Legesse S, Nigussie T, Yenew Y, Gashe K. Evaluation of public health surveillance system performance in Dangila district, Northwest Ethiopia: A concurrent embedded mixed quantitative/qualitative facility-based cross-sectional study. BMC Public Health. 2019;19(1):1–9.

21. Lee LM. Principles and practice of public health surveillance. Oxford University Press, USA; 2010.

Chapter IV: Health profile description report

4. Health profile description of Hulbareg Wereda Silte Zone, southern nation nationalities, Ethiopia, January 2023.

Executive summary

Background: This paper aims to assess Woreda's health profile, characterize health issues, and communicate local illness burden to guide potential treatments, highlighting its importance in prioritizing health and community-related concerns at all levels.

Objective: To describe health and health-related issues like health status and health indicators, to identify problems for priority setting, and to design an action plan for identified health problems of Hulbareg Woreda in 2022.

Methods: A descriptive cross-sectional study design was used for the description of the health profile of the Woreda Health Office, Woreda Administrative Office, Agriculture Office, Educational Office, Finance Office, and Economic Developmental Office from January 16, 2023, GC to February 15, 2023 GC. A prepared standardized checklist was used to collect data from all public sectors. After data compilation, the data were analyzed using Microsoft Excel and GIS. Frequency distribution, tables, and figures were employed.

Results: Woreda has 12 health posts, 4 health centers, and 6 private health institutions providing healthcare services. Coverage rates for ANC, PNC, delivery, contraceptives, penta 3, and measles are high. Pneumonia is the leading disease, followed by typhoid, and upper respiratory tract infection. Malaria cases increased by 5% from July to January 2022. Indoor Residual Spray coverage increased, and Insecticide-Treated Nets were distributed. HIV screenings and TB cases were high.

Conclusion: Pneumonia is the main health issue, with low healthcare coverage and workforce density. Accessibility is good for maternal and child health services, but malaria cases increased by 5%. The TB detection rate is low, and health centers should improve diagnostic capacity and provide strict direct observation therapy. Health budget allocation is below recommended.

Recommendation: Woreda's healthcare facilities lack basic infrastructure and medical professionals. To reduce malaria incidence, evidence-based malaria control strategies should be enhanced, HIV/AIDS counseling and testing services increased, and laboratory diagnostic capabilities bolstered. Implementing strict Directly Observed Treatment protocols is also crucial.

1. Introduction

1.1. Background

A health profile is a compilation of health and health-related data for a given community, which describes Woreda's health and other health-related situations. This description provides demographic, social, political, cultural, and other information about a particular geographic area of interest. It is also the process of gathering, assessing, and interpreting data from several, and diverse sources in order to gain a better understanding of community health. Prioritising community health and health-related concerns is critical for planning and implementing effective interventions. It is also a critical entrance point for community-based studies for stakeholders in health and health-related matters (1).

A health profiles evaluation encompasses both previously identified health problems and newly detected and emergent diseases (1). In general, community problems are identified and prioritised based on factors such as public health importance, scale, seriousness, community concern, problem feasibility, and so on.

The Community Health Profile report encompasses the following elements: historical context of the region, geographical and climatic characteristics, political and administrative frameworks, demographic details and population structures, economic conditions, educational attainment, transportation networks, telecommunications infrastructure, power supply status, disaster preparedness, hygiene and sanitation conditions, vital statistics and health metrics, evaluation of primary health care components, accessibility of health facilities, distribution of human resources, primary causes of morbidity and mortality in the region, along with a descriptive account of each community, highlighting both strengths and challenges from the viewpoints of the public health department and the wider community (1).

This document offers a comprehensive overview of health information aimed at assisting local authority members, officials, and community partners in their efforts to enhance public health. Additionally, it contributes to the enhancement of the availability and accessibility of health-related information nationwide. Typically, the factual data gathered in a health profile serves as a foundation for decision-making and policy formulation, as well as for assessing the health status of the specific woreda or area. This assessment is based on the findings, action plans, and

recommendations regarding the identified challenges, necessary resources, and timelines pertinent to the area or country (1).

A health profile assessment was carried out across various countries globally. In 2009, the Ministry of Health in Ghana undertook assessments of human resources in health, utilizing a range of indicators to illustrate various activities along with their performance, strengths, weaknesses, and challenges faced within the country (2). This staff health profile offers an extensive overview of the conditions faced by health workers. It outlines the policies and management strategies related to human resources for health (HRH) to assist in tracking HRH inventory and trends. Additionally, it serves as a foundation for dialogue among policymakers and stakeholders. The profile enhances the HRH information system by supplying evidence of baseline metrics and trends, while also promoting the sharing of information and enabling comparisons across different countries (2).

Malawi carried out a Demographic and Health Survey in 2016, which offered insights into the nation's circumstances and developments regarding significant health concerns(3). The analysis of the health profile encompasses institutional structures, primary functions of the state health agency, and patterns in state responses, as well as significant gaps and challenges. This document illustrates evidence-based health policy through an extensive examination of the evolving health conditions and the health system within the country (3).

In Ethiopia, the fourth Demographic and Health Survey was carried out in 2016 to provide current estimates of essential demographic and health indicators (4). The EDHS offers a detailed analysis of population dynamics, maternal and child health initiatives, the status of communicable diseases, and the quality of health services, thereby delivering critical insights into the trends of significant demographic and health indicators over time (5). The data gathered is instrumental for policymakers and program managers in assessing and formulating programs and strategies aimed at enhancing the health of the nations. The primary data sources utilized in the compilation of this document encompass all relevant governmental and non-governmental sectors within the Woreda, including the Woreda Administration, Agriculture, Health, Education, Water Resources, Culture and Tourism, Energy Bureau, and Finance Bureau. This document predominantly addresses the dates and activities of the year 2022 G.C.

The Woreda Health Profile report assesses public health issues in the Hulbareg Woreda area, identifying gaps and prioritizing actions. It covers historical aspects, geography, population structures, economy, education, transport routes, telecommunications, power supply, hygiene, key health indicators, primary health care components, health facility coverage, human resource allocation, morbidity root causes, and community strengths, weaknesses, and challenges.

1.2. Rationale

The health profile assessment of the Hulbareg Woreda is designed to evaluate the health status and indicators within the district, identify methods to enhance access to healthcare services, and offer essential community-level data to inform public health decision-making, resource distribution, and the establishment of priorities.

Health profile descriptions serve to outline the coverage of health services, developmental initiatives, and social services, while also identifying significant health issues and establishing their priorities. Additionally, they highlight risk factors and potential areas for enhancement. These profiles offer critical evidence for informed decision-making and assist in maintaining a comprehensive perspective on the health status of a community. Nevertheless, in certain regions, health profiles may be lacking in completeness and accessibility. The Hulbarage Woreda, recognized as a malaria hotspot, necessitates a detailed health profile description to assess the situation and implement appropriate interventions.

2. Objectives

4.2.1. General objective

To assess and describe health and health-related concerns such as health status and health indicators, identify problems for prioritization, and create an action plan for identified health problems in Hulbareg Woreda, Silte Zone, SNNPR, Ethiopia.

2.2. Specific objectives

- To assess the health service status of Hulbareg Woreda.
- To describe the health status of the community through health indicators.
- To describe health-related challenges.
- To assess the major causes of morbidity and mortality in the woreda.
- To identify priority health-related gaps in the community and design an action plan for identified health problems or gaps.

3. Methods and materials

3.1. Description of Study Area

The study was carried out in Hulbareg Woreda, SNNPR of Ethiopia. There are 11 kebles in the Woreda, and according to the 2007 census by the CSA, this woreda had a total population of 79,981, of which 38,284 (47.8%) were males and 41,697 (52.1%) were females; 2,198, or 2.75% of the population, were urban dwellers (5). The capital of Wereda, Kerate Town, is found at a distance of 15 km south-west of Werabe Town, 230 km north-west of Hawassa, and 188 km from Addis Ababa.

Hulbareg is bordered by the Hadiya Zone in the southwest, Misraq Azernet Berbere to the west, Alicho Werero to the north, on the Silte to the northeast, Dalocha to the east, and Sankurra to the south. It was formed from parts of Dalocha and Silte Woredas. The Woreda is also bounded by a natural boundary such as Achengero to the north, Anbericho Mountain to the south, Agam Mountain to east, Kalkal Mountain to the west. The absolute location of the woreda is 7o 45’ 42” up to 80 05’ 11’’N and 380 46’ 41” to 390 07’ 12’’ E latitude and longitude respectively. The majority of the residents were Muslims, with 98.65% of the population reporting that belief, while 1.04% practiced Ethiopian Orthodox Christianity.

Woreda has Woina-Dega agroclimatic conditions, with an average temperature of 20℃-24˚C and annual rainfall ranging from 110mm to 1200mm. 95.5% of the population is employed in

agriculture, with 70.25% agricultural land, 61.07% cultivated, and various wildlife habitats.

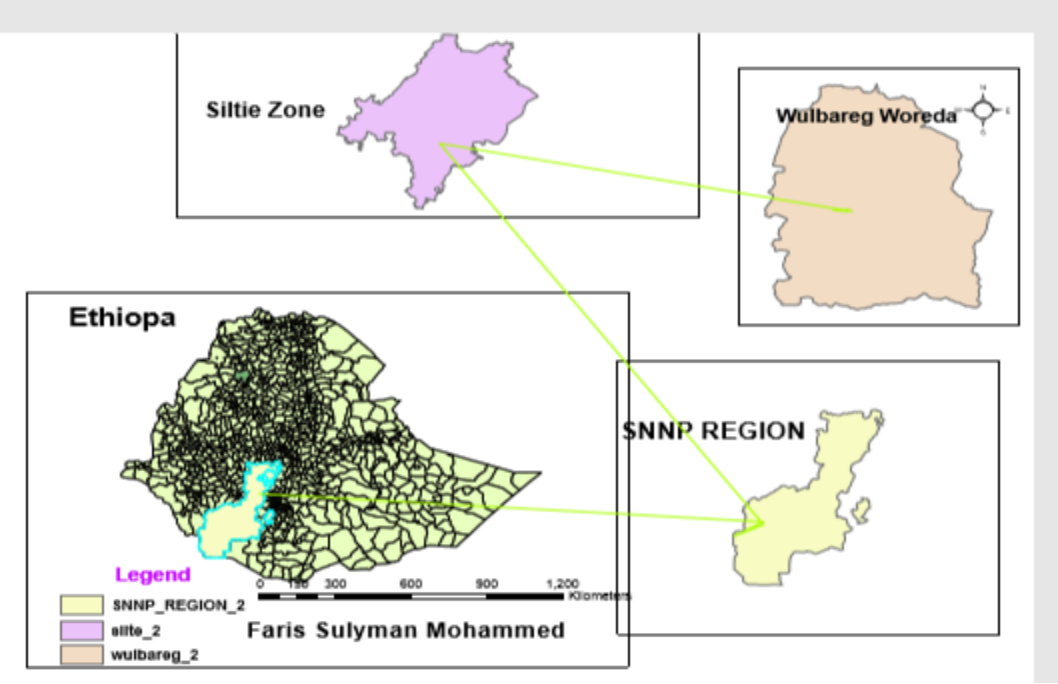

Figure 16: Map of Hulbareg Woreda, Silte Zone, Southern Nation Nationalities Ethiopia, Ethiopia. 2022

3.2. Study Period

This health profile description was carried out from January 16 to February 15, 2023, in the Hulbareg Woreda, Silte Zone, Southern Nation Nationalities Peoples of Ethiopia, Ethiopia, 2023.

3.3. Study Design

A cross-sectional study design was employed, utilizing a structured questionnaire and observational methods, to assess and illustrate the health care status within the Woreda. This approach aimed to identify the most significant health issues and provide recommendations for addressing the identified problems.

3.4. Sample size

No sampling was required to describe the health profile. The study was conducted by collecting information (performance) from different sector offices and using the 2022 annual report of different sectors.

3.5. Data collection

Data were collected through document review (secondary data). The secondary data were extracted from the eHMIS database and the annual reports of the Woreda health office using a data extraction tool. In addition, health-related data from other sectors (education office, Finance and Economic Development Office, Woreda Administration Office, Culture and Truism Development Office, Water and Energy Office, and Agriculture and Rural Development Office) were collected using structured questionnaires. The analysis for this health profile was based on data from EFY 2014, however the performance of some common health indicators prior to EFY 2014 was examined for comparison.

3.6. Data analysis

Data analysis was performed using various appropriate software's for this analysis; Microsoft Office, Excel, and others were used. Descriptive measures were calculated, and absolute numbers, percentages', and rates were used to present the data in words, tables, and figures

3.7. Data Management

Health-related data collected from the above organizations was entered, cleaned, and analyzed using Microsoft Excel 2013 and the result is presented using tables, different figures, and charts.

3.8. Ethical Consideration

The PHEM Directorate of the SNNPR Health Office approved the assessment and wrote an official letter to the to the Silte Zone Health Department. The Zone Head provided formal letters to several sectors of Hulbareg Woreda in order to gather the necessary secondary data.

3.9. Dissemination of the result

The findings of this woreda-level health profile report were delivered punctually to the Department of EFETP at the AAU School of Public Health, as well as to the relevant Woreda and zone health offices, in both hard copy and electronic format.

3.10. Operational definitions

Indicators: are measures that describe a behavior, concept, or phenomenon (6).

Pregnancy Care Coverage: Percentage of pregnant women who have had at least one visit from a healthcare professional for pregnancy-related reasons during the current pregnancy (6).

Average Household Size: The average number of members per household (6).

Child Mortality Rate: The probability of dying between exactly the ages of one and five per 1000 children surviving to their first birthday (6).

Contraceptive Acceptance Rate: Proportion of women of reproductive age (15-49 years) who are not pregnant and are accepting a modern contraceptive method (new and repeat acceptors) (6)

Contraceptive Prevalence Rate: Percentage of women of childbearing potential (15-49 years) who are currently using (whose partner is using) birth control (6).

Crude Birth Rate: The registered number of live births per 1000 population in a given year or period (6).

Crude Mortality Rate: The registered number of deaths per 1000 population in a given year or period (6).

Demography: The study of the population and its characteristics by reference to factors such as size, age structure, density, fertility, mortality, growth, and social and economic variables.
Health budget usage: Ratio of health budget usage to allocation (6).

Infant mortality rate: The number of registered infant deaths (less than one-year-old) per 1000 live births in a given year or period most cases were reported in a given year (6).

Leading Causes of Death: The leading causes of death under which the most deaths were reported in a given year (6).

Live Birth: The complete expulsion or removal from the pregnant mother, regardless of the length of the pregnancy, showing signs of life after such separation (6).

Leading causes of morbidity: The frequently occurring causes of morbidity among patients, of which the greatest number of cases have been reported during the year (6).

Leading causes of mortality: The most frequently occurring causes of mortality under which the greatest number of deaths have been reported during a given year (6).

Maternal Mortality Rate: The number of registered deaths among women, from any cause related to or aggravated by pregnancy, or its management (excluding accidental or incidental causes) during pregnancy, childbirth or within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, for every 100 000 live births in a given year or period (6).

Neonatal death: A death of a live-born baby within 28 days of birth (6).

Population: All inhabitants of a given area are considered together (6).

Postnatal care coverage: proportion of women who seek care, at least once during postpartum (42 days after delivery), from a skilled health attendant, including HEWs, for reasons relating to post-partum (6).

Proportionate mortality rate: describes the proportion of deaths in a specified population over a while of time attributable to different causes (6).

Safe water supply coverage: proportion of households using an improved water (free from harm) source as their main source of drinking water.

Sex ratio: The number of males in a population or specific sub-population, divided by a corresponding number of females, conventionally multiplied by 100.

Skilled Birth Attendant: proportion of deliveries attended by skilled health attendants (excluding trained or untrained traditional birth attendants) (6).

Stillbirth is a fetal demise with no evidence of life at ≥ 28 weeks of gestation (6).

Stillbirth Rate: proportion of stillbirths from total births attended by skilled health attendants.

TB cure rate: percentage of a cohort of new smear-positive TB cases registered in a specified period that were cured as demonstrated by bacteriologic evidence (a negative sputum smear result recorded during the last month of treatment and at least on one previous occasion during treatment (6).

TB death rate: percentage of a cohort of new smear-positive TB cases registered in a specified period that died during treatment, irrespective of the cause (6).

TB defaulter rate: percentage of a cohort of new smear-positive TB cases registered in a specified period that interrupted treatment for more than 2 consecutive months (6).

TB treatment success rate: percentage of a cohort of new smear positive TB cases registered in a specified period that successfully completed treatment (6).

Under-five mortality rate: The probability (expressed as a rate per 1000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates (6).

4. Results

4.1. Historical aspect of Woreda

The Hulbarag Woreda is one of the 10 woredas of the Siltie Zone, covering an area of 32,050 square kilometers. It was founded in 1998. Hulbareg is one of the woredas in the Region of Southern Nations, Nationalities, and Peoples of Ethiopia. As part of the Silte zone, it was created from parts of Dalocha and Silte woredas.

4.2. Geographic and climatic conditions

Hulbareg Woreda was found at a distance of 15 km south-west from Worabe, 230 km north-west from Hawassa, and 188 km from Addis Ababa.

The absolute positions of the Wereda were 7^{o} 45’ 42” up to 8^{0} 05’ 11’’N and 38^{0} 46’ 41” to 39^{0} 07’ 12’’ E latitude and longitude, respectively. Hulbarag is one of the Silitie Zone Woreda of the region with large flat land, mountainous area, and plateaus. Regarding the climate of Woreda, agroclimatic conditions are characterised by Woina-dega. The average temperature ranges from 20 °C to 24 °C, and the average annual rainfall ranges from 110 mm to 1200 mm.

4.3. Political and administrative organization

The woreda is administratively classified into 11 kebeles, one urban and 10 rural. Of the 10 rural kebeles, two were in the highlands, and the remaining 8 were lowland. All administrative offices of Wereda were located in the city of Woredas. There were 32 offices, each governed by a chief and a deputy chief, called a cabinet. The nearest kebele were Wacho Obiso, which is 5 km from the woreda centre, and the remote kebele were Tode Temeda, which is 28 km from the woreda center. The administrative centre of the district is Kerate town.

All sectors of the Woreda were found in the town. The area is bordered by Hadiya Zone in the southwest, Misraq Azernet Berbere in the west, Alicho Werero in the north, Silte in the northeast, in the north by Alicho Werero, to the northeast by Silte, to the east by Dalocha, and to the south by Sankura. This Woreda was established from sections of Dalocha and Silte Wereda. Additionally, it is delineated by natural features, including Mountain Achengero to the north, Mountain Anbericho to the south, Mountain Agam to the east, and Mountain Kalkal to the west.

4.4. Demographic information

According to the 2007 Census conducted by the CSA, this Woreda had a total population of 79,981 of which 38,284 (47.8%) were males and 41,697 (52.1%) were females; 2,198 or 2.75% of the population were urban dwellers. In the EFY 2014, the total population was estimated at 98,869, of which 48.2% were male and 51.8% were female.

The Woreda has a total population of around 96884 from 19772 households, including 46748 males and 50166 females. The male-to-female ratio within the population is approximately 1:1. Among the total population of the Woreda, there are 2,892 children under one year old, representing 2.98% of the population. Those under five years old account for 14.6%, totaling 14,153 individuals. The population of individuals under fifteen years old is 46,375, which constitutes 47.8%. Additionally, there are 3,398 individuals over the age of 65, making up 4.74% of the population. Women of childbearing age number 15,863, or 22.13%, while pregnant women total 2,690, representing 2.7%. Non-pregnant women account for 5.6%, with a total of 5,455 individuals. Overall, 92,528 residents, or 95.5%, reside in rural areas of the Woreda.

The pyramid age structure indicates the high number of children under the age of fifteen. Children under the age of 15 accounted for approximately 47.8% of the total population, which is typical of high fertility populations, while just around 4.74% of the population is over 65 years old. Regarding ethnic composition. Woredas' population consists of Site and Amhara peoples who speak Siltega and Amharic languages. Woreda's population was predominantly Muslim, with 95.5% professing this faith, while 3.2% embraced Ethiopian Orthodox Christianity and1.3% were Protestant.

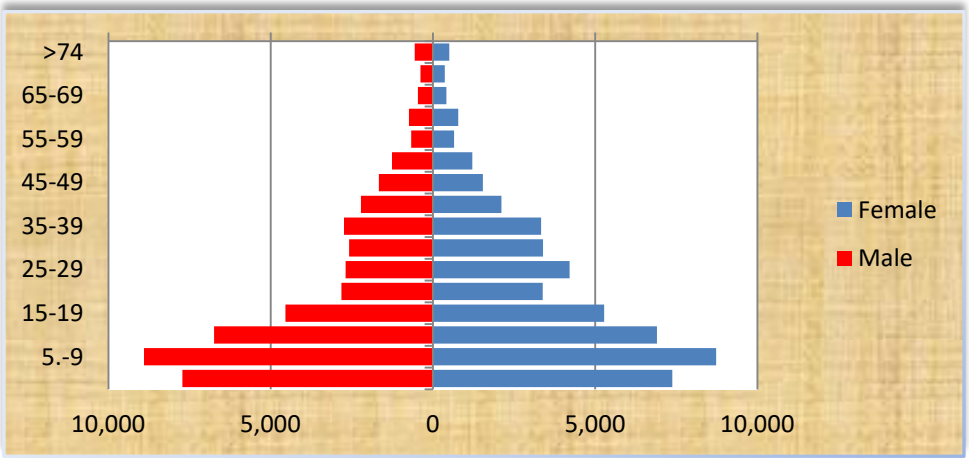

Figure 17: Population Pyramid of Hulbareg Wereda, Silte Zone, SNNPR Ethiopia, 2022

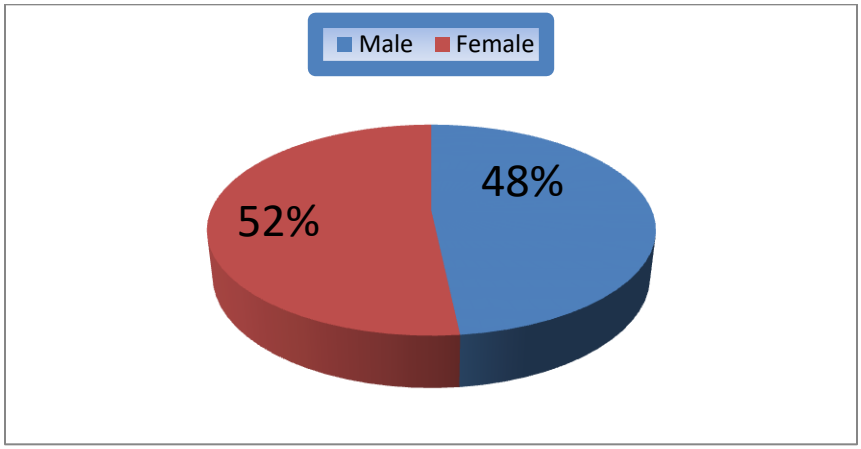

Figure 18: Population distribution by Sex in Hulbareg Woreda SNNPR Ethiopia, 2022.

4.5. Main Income

Woreda's main source of income was agricultural products, such as farms and livestock. Woreda's principal crops include grains such as tef, wheat, barley, peas, beans, maize, sorghum, and cash crops like as onions and potatoes, which are grown twice a year in the summer and winter using rain and irrigation. 22515 (70.25%) agricultural areas, with 2943 (9.18%) for dairy cattle. Because farmers make up the vast bulk of Woreda's population, agriculture employs 95.5% of the workforce. An assessment of the land in this woreda reveals that 22515 (70.25%) is arable or cultivated, 19572.9 (61.07%) is cropland, 2942 (9.18%) is grassland, 3917 (12.22%) is forest, and the remaining 1250 (3.9%) is swampy, hilly, or otherwise unsuitable. The person's typical monthly income was unknown.

4.6. Water and Power Supply

According to information acquired from the Hulbareg Woreda Water Office, the sources of drinking water are classified according to their use as tap water, spring water, and river water. 59% (58332) of the Woreda population were supplied with tap water, 36.7% (3536) of the kebele population were supplied with sheltered wells, and 23% (23,000) of the kebele population used river water. There were various energy sources in the Woreda: firewood, dung, crop residues,

kerosene, electricity, and charcoal were classified according to their importance in the Woreda. There were five kebeles (Bilewanija, Demeke, Demeke, Angamo, and Kerate) that had electricity. All health centers in Woreda had electricity, but only one health centers had water supplies. Even if there were electricity in the kebeles none of the health posts had electricity.

4.7. Education

In Hulbareg Woreda, there are 32 government schools, 30 primary, and 2 high schools. No Kinder Garden, preparatory, and TVET College in the Woreda. In addition, there are no governmental organizations or private schools. In 2014 EFY, a total of 22,167 students were enrolled; 21,430 (96.6%) were primary students, with 4478 (54%) male and 3344 (46%) female students. 737 (3.3%) were secondary school students, with 399 (54%) male and 338 (46%) female students registered and started class. Of both school's enrolment, 46% were female, and there was a difference from grade to grade. Among Hulbareg Woreda students, 3 (1 male and 2 female) are students with disabilities. See the detail in Table 7 below.

Table 6: Number of registered students and teachers by gender in Hulbareg Wereda, Silte Zone, SNNPR-Ethiopia, 2022.

Types of School	Gender of student	# student	Percentage
Primary school (1-8)	Male	11506	54%
	Femal	9924	46%
	Total	21430	100%
Secondary school (9-10)	Male	399	54%
	Femal	338	46%
	Total	737	100%
Total enrolment (both schools)	Male	11905	54%
	Femal	10262	46%
	Total	22167	100%

Table 7: the Number of Student to Teachers Ratio in Hulbareg Woreda in 2022.

	gender of teachers	#teachers	Student to teachers ratio
number of teachers Primary school (1-8)	Male	270	
	Female	96	
	Total	366	1:59
Secondary school (9-10)	Male	34	
	Female	25	
	Total	59	1:13
	Both total	425	1: 52

The Woreda has 59 teachers (34 males and 25 females) who teach primary and secondary school. The teacher-to-student ratio is 1:52. This means that there is one teacher for every 52 students in Hulbareg woreda.

4.8. Water source

The Hulbareg Woreda Water Board classifies drinking water sources based on their value as tap water, spring water, and river water. 11 kebeles that receive pipe/drinking water. Drinking water is provided to 59% (58332) of the Woreda population, 3536 (35.7%) of the Kebeles population via sheltered wells, and 23,000 (23%) of the Kebeles population by river water.

4.9. Natural resource

In Woreda, some minerals are important for building materials and as raw materials for industry. Among these, the Woreda is rich in sand, white rock, granite, sedimentary rock, limestone, and selected materials are the most important. These minerals, especially sand, and rock, are used for building purposes for the surrounding cities like Kerate, Worabe, Dallocha, Kibet and some others. It plays a big role in creating job opportunities for various unemployed groups. There are road problems to easily extract minerals.

4.10. Facilities and infrastructures

The road is the main infrastructure for everyday activities. Of the 11 kebeles of the woreda, four kebeles (Bilewanija, Werabet, Ambericho Achamo, and Ambericho Gimba kebeles) have all-weather road transport to the woreda; seven kebeles were only in the dry season. All health centers in Woreda have transport access, and out of 12 health posts, 4 health posts have transport access in all weather conditions, but 8 health posts only in dry weather. In terms of communication, all of the urban and rural Kebeles have used cell phone services, including health centers and health posts, and there have been no network problems. Only one in four health centers has access to safe water, but health posts have no water supply. In the Woreda, 4 kebele were powered by electricity; the remaining 6 kebele had no power. There are two operational ambulances in the Woreda (see Table 8 below).

Table 8: Infrastructure in health facilities in Hulbareg Wereda, Silte Zone, SNNPR, Ethiopia, 2022

	Total facilities	Number of facilities with				Ratio
Facility Type	Total Facilities	Water Access	Power Supply	Telecommunication Service	Rod Access	
Primary hospital	0					
Health centers	4	1	4	Cell phone	4	1:23,556
Health posts	12	0	0	Cell phone	4 all weather and 7 only dry weather	1:8,566
Private clinics	5	3	4	Cell phone	3 all weather 1 at dry season	1:31,408
Pharmacy	3	2	3		All weather	
Diagnostic laboratorial	0					

4.11. Disaster situation in the woreda

There was no record of any disaster in the Woreda in 2022 GC.

4.12. Vital data and health indicators

Data on infant mortality rate, child mortality rate, crude birth rate, crude death rate, maternal mortality rate, still births, and neonatal deaths were unavailable both at the Woreda and health facility level..

4.13. Community Health Service

4.13.1. Cold chain system

In the Hulbareg Woreda, all four health centers and seven health posts are equipped with operational refrigerators that utilize both solar energy and electricity. This setup guarantees effective cold chain management systems, which are essential for maintaining vaccine efficacy and preventing outbreaks.

4.13.2. Immunization Coverage (EPI)

The Woreda vaccination program focuses on vaccine-preventable diseases, with 99% of live births in 2022 being vaccinated against BCG. Among 2892 eligible infants, 102% were vaccinated with penta-1 and penta-3 vaccinations. 99% of children under 1 year were vaccinated against measles, with 99.6% protected at birth.

Table 9: Immunization Coverage Hulbareg Woreda, Silte Zone, SNNPR-Ethiopia in 2022

SN	Vaccine	2019	2020	2021	2022
1	BCG	95%	96%	96%	99%
2	PAB	101%	99%	101%	100%
3	Penta1	101%	102%	105%	102%
4	Penta3	100%	100%	103%	100.20%
5	PCV1	101%	102%	105%	102%
6	PCV3	100%	100%	103%	100.20%
7	Measles1	99%	98%	101%	99%
8	Measeles2	54%	66%	93%	94%
9	Fully immunization	98%	98%	99%	101%
10	Penta1/ Penta3 DOR	0.98%	1.50%	1.40%	1.50%
11	Penta to measles	2.30%	3%	3.50%	5.30%

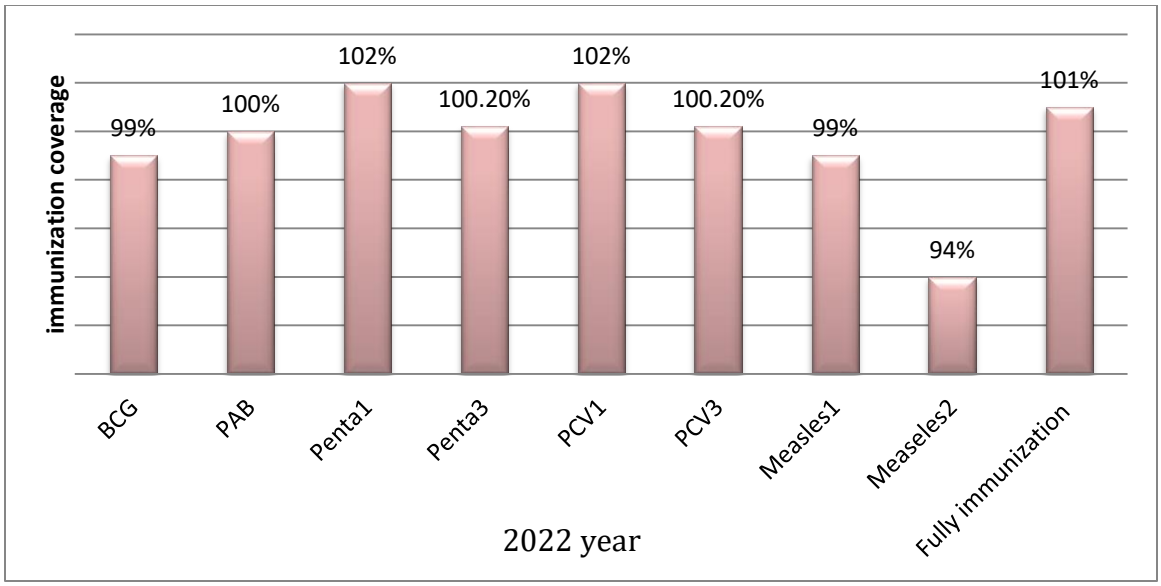

Figure 19: Immunization coverage of Hulbareg Wereda, Silte Zone, SNNPR-Ethiopia in 2022

To prevent unintended pregnancy, woreda health offices provide family planning services through health extension workers at each kebele level and also in all health centers. During 2022, the overall contraceptive acceptance rate (CAR) was 107%, with the lowest rate in the Kerate cluster (63%), and the highest rate in the Amberico Gimba cluster (105%). An increment was observed in four clusters.

Table 10: Contraceptive Acceptance Rate in Hulbareg Wereda, Silte Zone, SNNPR-Ethiopia in 2022

Years	Bilewanija Demeke	Kerate	Ambericho Gimba	Angamo Yede	Total
2018	84%	100%	103%	106%	95%
2019	97%	89%	94%	99%	94%
2020	98%	90%	114%	96%	98%
2021	79%	88%	110%	103%	91%
2022	109%	87%	119%	113%	107%

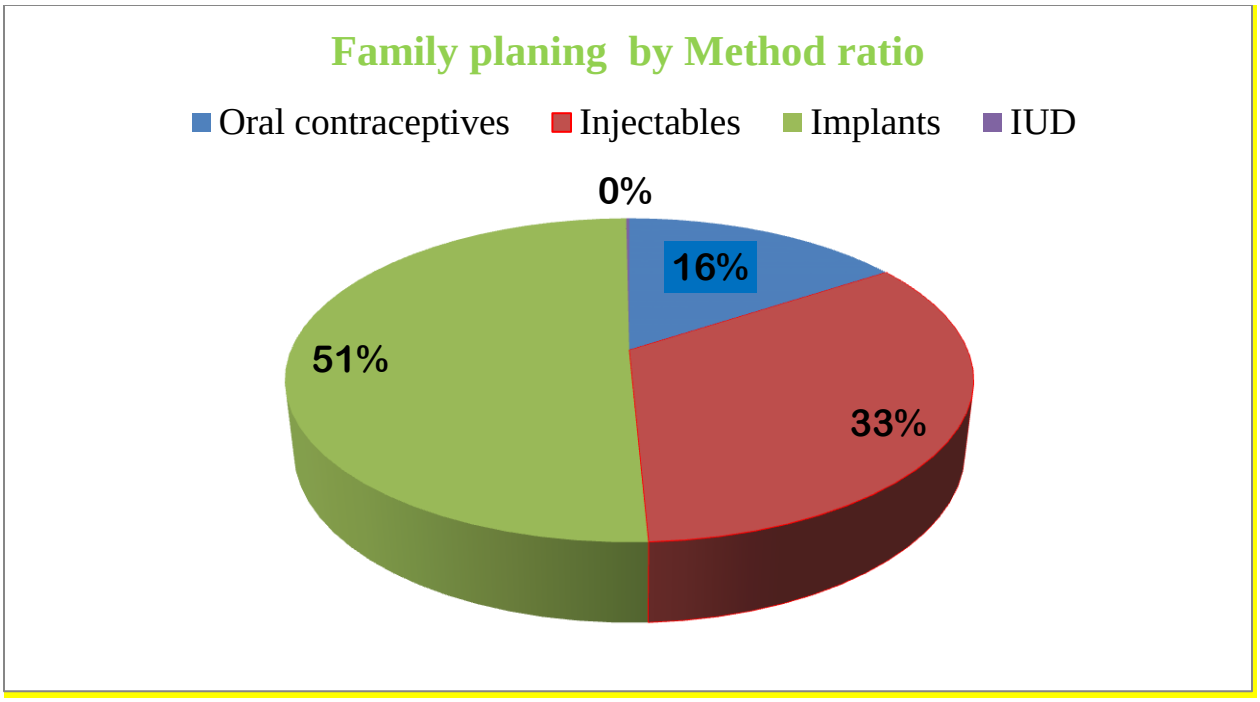

Figure 20: Proportion of Modern Contraceptive Acceptors by method in Hulbareg Wereda, Silte Zone, SNNPR-Ethiopia in 2022.

According to the report from the Hulbareg woreda health office, the coverage for the first visit of antenatal care (ANC) was recorded at 101%, while the coverage for the fourth ANC visit was 97%. Additionally, the percentage of deliveries attended by skilled personnel was 94%. The coverage for early postnatal care (PNC) was noted to be 102%.

Table 11: Antenatal Care. Birth attended by skilled personal and and postnatal care in Hulbareg Wereda, Silte Zone, SNNPR-Ethiopia in 2022

	Activities	2018	2019	2020	2021	2022
	ANC1	101	100	99%	101%	101%
	ANC4	99.5	94	101%	96%	97%
	SKILL DELIVERY	99	96	100%	96%	94%
	Post Natal Care	99	102	100%	96%	102%

4.14. Health service (Facility-based)

The woreda has four government health facilities, 12 health posts, and 5 private clinics. As of 2022, one health center serves 24,717 residents and one post serves 8339. 214 health professionals and supportive staff were employed in 2022, with 32 health officers, 39 nurses, 20 midwife nurses, 12 medical laboratory personnel, 6 pharmacists, and 2 environmental health professionals.

Table 12: Human Resource Distribution by Professions in Hulbareg Woreda Silte Zone, Southern Nation Nationalities Region, Ethiopia, 2022.

S/N	Type		Number	Total type	HW:Pon ratio	Remark
1	Physicians		4	4	1:24717	
2	Health Officers		20	20	1:4943	
3	Nurses	Clinical nurse BSC	8	39		
		Clinical nurse Diploma	28			
		Public health nurse diploma	3		1:2535	
4	Midwifery nurses	Midwifery nurse BSC	13	20	1:4943	
		Midwifery nurse diploma	7			
5	Laboratory	Lab. Technologist	4	12	1:8239	
		Lab. Technician	8			
6	Pharmacy	Pharmacist	3	6	1:16478	
		Druggist	3			
7	Biology		1	1	1:98869	
8	Environmental Health	Environmental health (BSC)	2	2	1:49435	
		Environmental health Diploma	0			
9	HEWS	Health exstansion worker (Rular)	22	23		
		Health Extension worker (Urban)	1		1:4299	
10	HIT		4	4	1:24717	
11	Others Supportive staff		83	83	1:1191	
Total			214			

4.15. The leading cause of death and morbidity

Pneumonia accounted for 2,694 cases (7%) among adults, making it the main cause of morbidity. This was followed by typhoid fever with 2,460 cases (6%), urinary tract infections with 1,973 cases (4.9%), and dyspepsia with 1,517 cases (3.76%).

Table 13: Top ten determinants of morbidity in adult OPD in Hulbareg Woreda, Southern Nation Nationalities Region, Ethiopia, 2022.

SN	Types of Disease	Number of cases	Percentage	
1	Pneumonia	2694	7%	
2	Typhoid fever	2460	6%	
3	Urinary tract infection	1973	4.9%	
4	Dyspepsia	1517	3.76%	
5	Heliminthiasis	1076	2.67%	
6	Tonsillitis	1038	2.58%	
7	Respiratory infection	891	2.2%	
8	Malaria	795	2%	
9	Common cold	716	1.8%	
10	Giardiasis	604	1.5%	
Total	Total	40242		

Table 14: Top five common cause of outpatient morbidity in pediatrics in Hulbareg Woreda, SNNPR, Ethiopia, 2022.

SN	Types of disease	Number of cases	Percentage
1	Pneumonia	1273	14.7%
2	Diarrhea(non-bloody)	983	13.1%
3	AURTI	853	11.5%
4	AFI	652	10.54%
5	Neonatal sepsis	589	8.3%

4.16. Health budget allocation

The health sector received 1,194,259 Ethiopian Birr (8.6%) of the overall budget of 13,886,734.22 given by the Woreda. Salary, top-up, and other government funds, as well as all health-related spending, were used. The Woreda received financial and technical support from a variety of non-governmental organizations (NGOs). ONE WASH funded 280,000 Ethiopian Birr for the construction of a latrine in the school, as well as 63,000 for capacity building and supervision. The entire budget allocated above has been spent for the designated programs

4.17. Endemic diseases

4.17.1. Malaria

IRS chemical spray was performed in one kebele, utilizing 50,000 birr. Out of 16,963 at-risk populations, 10599 suspected cases were confirmed. 171 kg of cyanlope chemicals protected 7,536 (95%), covering 2246 units in 2023.

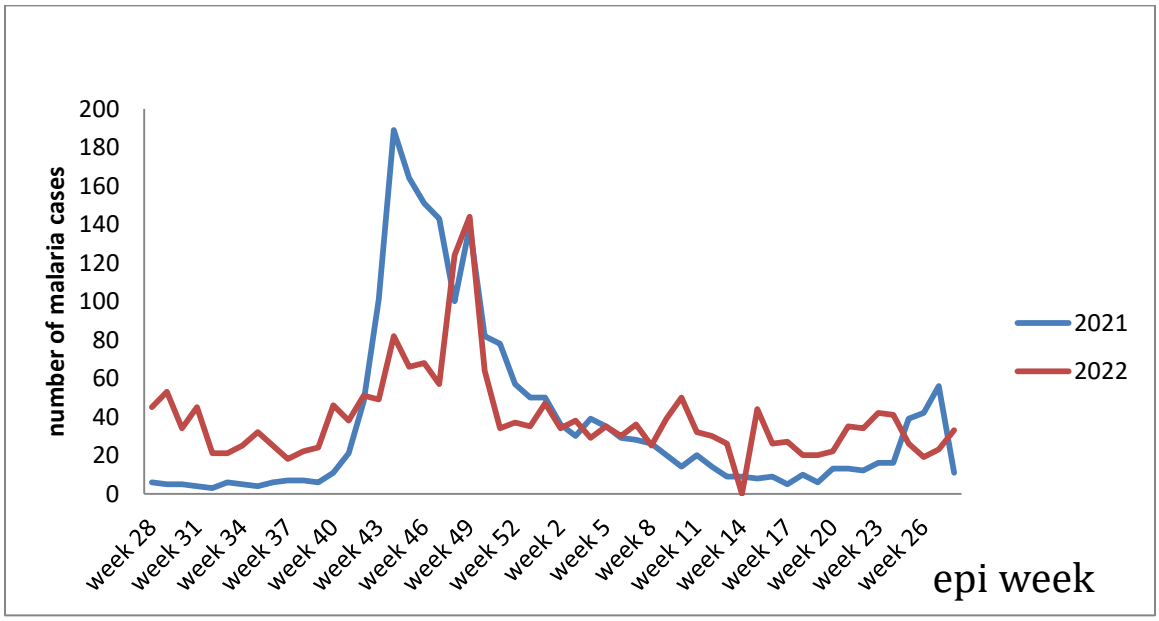

Figure 21: Trend of malaria in Hulbareg Woreda, Silte Zone, Southern, Nation, Nationalities Region, Ethiopia, 2022.

4.17.2. TB & Leprosy

The overall TB detection rate in Woreda was 70% (59%). A total of 25 (21%) PTB cases were diagnosed, with a cure rate of 23 (92%). Two patients were lost, and two developed MDRTB. Both MDRTB patients were referred to the TIC at Hosanna General Hospital for treatment. There were no leprosy patients who were receiving treatment.

Table 15: TB case dedection rate by cluster in Hulbareg Woreda, Silte Zone, Southern, Nation, Nationalities Region, Ethiopia, 2022.

SN	Cluster	Number of estimated all types of tuberculosis cases	The number of newly detected all forms of tuberculosis cases	TB CDR
1	Hulbareg	39	31	79%
2	Bilewanija	39	15	41%
3	Gimba	22	16	73%
4	Angamo	20	8	40%
	Total	120	60	59%

Table 16: Proportion of bacteriologically confirmed new PTB in Hulbareg Woreda, Silte Zone, Southern, Nation, Nationalities Region, Ethiopia, 2022.

SN	Cluster	Plan	Smear positive pulmonary TB	Smear negative pulmonary TB	EPTB	Coverage	
1	Hulbareg	39	11	12	8	79%	
2	Bilewanija	39	9	1	5	41%	
3	Gimba	22	5	6	5	73%	
4	Angamo	20	0	4	4	40%	
	Total	120	25	23	22	59%	

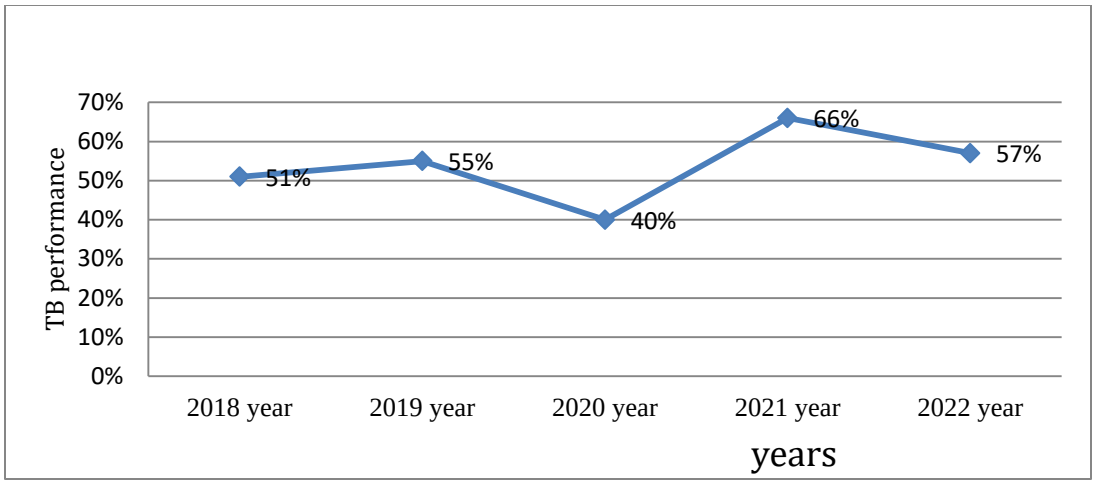

Figure 22: TB activites performance trend in Hulbareg Woreda, Silte Zone, Southern, Nation, Nationalities Region, Ethiopia, 2022.

4.17.3. HIV/AIDS

The three 90s should be reached as envisaged in the second health sector transformation plan. Of the overall at-risk population, 90% should be screened for HIV/AIDS, 90% of those seen overall positive should be associated with ART, and of those associated with ART, 90% should be associated with 90% of the patient's viral load to be suppressed to less than 1,000 copies. According to the data acquired by this Woreda from 4045 vulnerable individuals, 2806 (69%) were checked for HIV/AIDS, with two of them testing positive. Of the 32 HIV/AIDS positive persons, 32 (100%) are on ART, and 25 (78%) have viral loads detected. Of the 24 (96%) related with ART, viral load is suppressed (less than 1000 copies). CD+ is conducted on all 32 instances of HIV/AIDS associated with ART (100%).

4.17.4. Nutrition status

In Woreda, one health center and four health centers provide SC and OTP, respectively. Of the 12,639 children aged 6 to 59 months who got vitamin A supplements, 11,182 (87.8%) and 8,456 (98%) children aged 2 to 5 years received deworming. Out of a total of 4695 underweight children aged <5 years, only 3042 (65%) are recognized and treated for malnutrition, including 286 SAM cases. Of the 286 patients participating in the OTP program, 276 (96.5%) were healed, while all (6) patients enrolled in the SC program were treated and discharged.

4.17.5. Vital medications and additional supplies

An agreement exists between the Woreda and EPSA, which serves as a supplier of medicines and medical products; however, numerous challenges persist within the supply system for these essential items. The Woreda has requested 146 healthcare items but has only received 43, representing a mere 29% of the requested supplies, leading to complaints from patients utilizing their healthcare facilities. There are significant limitations regarding the availability of essential medications in the Woreda, with no laboratory supplies provided by EPSA, and all program drugs having a concerning short shelf life of less than three months. Furthermore, the organization has failed to supply medications for opportunistic infections affecting adults and children, as well as treatments for individuals suffering from poisoning. Overall, the Woreda has reported a critical shortage of essential medicines, laboratory reagents, and diagnostic kits, which are currently unavailable in the market.

4.17.6. Potential Risk Factors of Outbreak

The Woreda health department may not have documented any outbreak reports; however, there were multiple suspected instances of diseases including anthrax, acute flaccid paralysis (AFP), and measles. The three diseases that were identified as possible dangers of an outbreak in Woreda were AFP, measles, and malaria.

5. Discussion

The findings indicate that pneumonia and typhoid are the predominant contributors to adult morbidity in Hulbareg Woreda. Among the rural population in this area, 59% use protected spring water sources for their drinking needs, a figure that exceeds the national average reported by the EDHS, where only 35% of the population utilizes such water sources. Furthermore, of the 20,117 households surveyed, 16,094, representing 80%, have access to improved latrines, with 75% of these households actively using them. In contrast, the EDHS study reveals that merely 9% of households across the country possess improved latrines, highlighting a significant discrepancy in Hulbareg Woreda.

Two of the ten rural kebeles have been classified as ODF kebeles. Despite widespread toilet usage, typhoid was the second greatest cause of morbidity following pneumonia, accounting for 6.9% and 7%, respectively. The majority of vaccination coverage for each antigen was better than 95%, exceeding the Ethiopian data evaluated by EDHS in 2016. Out of a total of 3,137 expected pregnancies, 2,955 (94%) of them were delivered in healthcare facilities. Although ANC1 and PNC1 coverage was 3162 (101%) and 3015 (102%), respectively, laboratory services provided syphilis tests and hemoglobin determinations to all pregnant women. This was greater than the EDHS rate in Ethiopia, where only 62% of pregnant women receive ANC1. 3162 (101%) of pregnant and nursing women have tested for HIV/AIDS and are aware of their status. According to data obtained by this Woreda, 2806 (69%) of 4045 vulnerable people are checked for HIV/AIDS, with two of them testing positive. The EDHS survey found that just 19% of vulnerable groups were assessed, which is lower than Hlbareg Woredas. Of the 32 HIV/AIDS positives known in Woreda, 32 (100%) are on ART, and 25 (78%) have a viral load of less than 1000 copies.

The TB detection rate in Woreda was 70 (59%), total PTB positive detected 25 (21%), the cure rate 23 (92%), and two (8%) MDR cases were found in new PTB patients who began treatment at Hossana General Hospital TIC. This finding was greater than the EPHI study conducted in 2014, which found 2.3%. There were nine malarious kebeles; Malaria was a common problem in the Woreda, which increased by 5% over the last year. Out of 286 patients engaged in the OTP program, 276 (96.5%) were cured, whereas all patients enrolled in the SC program were treated and discharged.

The Woreda has requested 146 healthcare items but has only received 43, which constitutes a mere 29% of the items that patients have reported as necessary in their healthcare facilities. There is a notable shortage of essential medications within the Woreda, compounded by the absence of laboratory supplies from the PFSA, and all program drugs are facing imminent expiration, with less than three months remaining. Additionally, the EPSA has failed to provide medicines for both adults and children, as well as treatments for individuals suffering from poisoning. The Woreda has indicated a significant deficit in essential medicines, laboratory reagents, and diagnostic kits, which are currently unavailable in the market. Furthermore, critical health statistics, including all-cause mortality rates, total births, and mortality rates for children under one and five years old, along with the leading causes of morbidity and mortality in pediatric populations, have not been documented in the Woreda. The health office of the Woreda has identified several primary challenges, including a constrained budget, insufficient medical supplies from EPSA, inadequate water and electricity at health centers and posts, and a shortage of healthcare personnel. Providing quality healthcare service to the community and maintaining acceptance of community infrastructure is the most important and important component. A health post was established in each kebele as an HSDP plan. In Hulbareg Wereda, a health post serves 7,390 residents and does not meet the HSDP target (1:3000-5000 residents). On the other hand, it is important to provide delivery, and other services, water supply and electric power.

None of the health posts had a water and electricity supply in the health station, but only five Kebekes had a water supply and electricity supply. The other HSDP plan related to a health facility was to build a health center that would serve 5 kebeles or 25,000 populations. In Hulbareg Woreda, a health center for 22,169 inhabitants and less compared to the national performance was provided, 1:30794 which is inhabitants and is good compared to the regional performance. In addition, a good water and electricity supply is a must in any health center. But in Hulbareg Woreda, only one health center has water supply, but four health centers have electricity in the health center. In addition, the Woreda Primary Hospital has not yet been built.

According to the Woreda assessment in early 2014, there were health worker densities of about 8, 11, 9 and 10 per 1000 inhabitants for health officers, nurses, midwives and health advisors, respectively (H.O 1:3090, nurse 1:2535, M. wife 1:4943 and HEW 1:4299). It is relatively low compared to the 2003 regional and national report, namely HO 1:24.146 at regional and 1:22.387

at national level, Nurse 1:2958 and 1:2772, M. Wife 1:35906 and 1:33903 and HEW 1 :2277 and 1:2647 at regional and national level respectively. Furthermore, based on the BPR staffing structure at health center level, 2 health officers, 8 nurses (BSc and Diploma), 2 midwives, 2 pharmacists, 2 laboratory and 1 HIT are needed for a total of 17 health workers in a health center. Based on this BPR structure in Hulbareg Woreda, 8 HO, 32 Nurses (BSc and Diploma), 8 Midwives, 8 Pharmacy, 8 Laboratories and 8 HIT are needed in all Health Centers with a total of 68 Health Workers to fully deliver the Health Service to the community. On the other hand, 32 HO, 39 nurses, 20 midwives, 6 pharmacies, 12 laboratories and 4 HIT are available as health workers, with a total of 113 health workers working in health centers. The health budget allocation in Hhulbareg Woreda was below the 2003 regional and national report and the Ministry of Health's annual target, 13%, 10% and 15%, respectively.

6. Limitations

Vital data such as infant mortality rate, neonatal mortality rate, underfive mortality, and maternal mortality rate were not accessible at the Woreda Health Office or health centers. Sectors employ distinct denominators rather than the same population size.

7. Conclusion

Pneumonia emerged as the most significant health challenge, compounded by inadequate health care coverage and a low density of health workforce personnel. While accessibility to health care for mothers and children services was relatively good, all services aimed at the control and prevention of communicable diseases were available. However, there was a 5% increase in malaria cases compared to the previous year, and the rates of HIV testing and screening remained alarmingly low. Furthermore, the detection rate for tuberculosis was considerably below the national average, indicating a pressing need to enhance the diagnostic laboratory capabilities of health centers to improve TB detection rates. Additionally, it is essential to implement strict Directly Observed Treatment protocols for tuberculosis patients. The allocation of the health budget was also found to be below the recommended percentage.

8. Recommendation

- ✓ The Woreda should set aside an appropriate budget for the health sector as a whole, as well as for public health emergencies/health-related events.
- ✓ The Woreda has insufficient safe water coverage, necessitating the Building of new water sources, and repairs to existing ones.
- ✓ The Woreda must enhance its laboratory capabilities to improve the detection rate of pulmonary tuberculosis and to ensure accurate diagnosis.
- ✓ The Woreda is responsible for ensuring the provision of water and electricity to health posts that currently have access to these essential services.
- ✓ Vital data and Health indicators like, maternal mortality rates should be recorded.
- ✓ HIV/AIDS counseling and testing should be increased.
- ✓ Health education and malaria control strategies interventions should be strengthened.

Table 17: Action plan for priority problem in Hulbareg Wereda, Silte Zone, February 2022

SN	Identified problem	source of the problem	The solution	Responsible	Time frame
1	Low TB detection rate	➢ Poor TB identification following index case ➢ Poor referral linkage ➢ Poor Community awareness	➢ Strength TB identification following index case ➢ Strength referral linkage ➢ Create Community awareness	Community HWs HEWs	Start from now
2	High Prevalence of malaria	➢ Poor environmental management ➢ Poor ITN utilization ➢ Poor community awareness	➢ Strength environmental management ➢ Proper utilization of ITN ➢ Create Community awareness	Community HWs HEWs	Start from now
3	shortage fund for PHEM activities	➢ Less attention PHEM activities	➢ fund allocation PHEM activities	Woreda WorHO	From next year
4	Shortage of drug and medical supply	➢ Less fund allocation and weak HCF	➢ fund allocation improvement ➢ Strength HCF	Woreda HFs	From next year
5	shortage infrastructure	➢ Lack of fund	➢ Budget allocation from government ➢ Community involvement	SNNPR, ZHD, Woreda & Community	From next year

Table 18: The main community problems of Hulbareg Woreda, Silte Zone Southern, Nation, Nationalities, Region-Ethiopia during study period based on priority criteria, February 2022

SN		Magnitude (5)	Feasibility (5)	Community concern (5)	Government concern (5)	Total grade
1	Low TB detection rate	5	4	5	5	19
2	High Prevalence of malaria	5	3	5	5	18
3	Inadequate fund for PHEM operation	5	4	4	4	17
4	Shortage of drug and medical supply	4	3	5	4	16
5	Lack of infrastructure	4	3	5	3	15

References

1. Ellicott VL. Introduction to Public Health. Am J Public Heal Nations Heal. 1944;34(12):1287–1287.

2. Ghana Health Workforce Observatory(GHWO). Ghana Human Resources for Health Country Profile Human Resources for Health Country Profile Ghana. 2010;71. Available from: http://www.moh.gov.gh/wp-content/uploads/2016/02/Ghana-hrh-country-profile.pdf

3. National Statistical Office. Malawi Demographic and Health Survey 2015-16. Natl Stat Off DHS Progr [Internet]. 2017;1–658. Available from: http://dhsprogram.com/pubs/pdf/FR319/FR319.pdf

4. Gunasekera HR. Demographic and Health Survey--1993. Vol. 1, Sri Lanka journal of population studies. 1998. 107–110 p.

5. Central Statistical Agency of Ethiopia. Population and Housing Census 2007 Report. Cent Stat Agency, Addis Ababa [Internet]. 2007;385. Available from: http://www.csa.gov.et/surveys/Population and Housing census/ETH-pop-2007/survey0/data/Doc/Reports/National_Statistical.pdf

6. Guide R. Hmis Indicators. 2022;

Chapter V: Scientific Manuscripts for Peer-Reviewed Journals

5.1. A Five-years retrospective malaria surveillance data analysis in Silte Zone, Southern Nations Nationalities People's Region, Southern Ethiopia from July 2018 to June 2022.

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Abstract

Background: Malaria, a Plasmodium-causing disease, is a significant public health issue in Ethiopia, causing high mortality and poverty. The Silte Zone's surveillance data analysis aims to assess disease incidence, trends, and control programs' effectiveness, proposing recommendations for prevention and control measures.

Objective: To describes Malaria cases, deaths, and positivity rate by species and its trends by person, time, and place in Silte Zone Southern Nation Nationalities Peoples Region, Ethiopia.

Methods: A retrospective document review was conducted. Five years of malaria surveillance data from 2018 to 2022 were collected from the national Public Health Emergency management (PHEM) database. Data were collected, entered, cleaned, analyzed, and interpreted using Microsoft Excel-2010 and Arc GIS. Tables, figures and maps were used to present results.

Results: Between 2018/2019 and 2021/2022, 36,619 (35.3%) of patients were examined for malaria, with a 36.12% test positivity rate. Plasmodium falciparum was the most common, followed by vivax. The annual parasite incidence rate was 10.14 per 1000 at-risk populations per year.

Conclusion and recommendation: The study highlights malaria as a public health concern, with P. falciparum being the predominant species. Despite occasional trends in confirmed cases over the last five years, clinical cases, hospitalizations, and deaths have reached almost zero.

Introduction

Background

According to the latest World Malaria Report, there were 247 million malaria cases in 2021 compared to 245 million cases in 2020 (1). The estimated number of deaths from malaria was 619,000 in 2021, compared to 625,000 in 2020. In the past two years, the number of malaria cases worldwide has increased by 14 million cases and deaths from disruptions by 47,000 during the coronavirus pandemic. Malaria is one of the main infections affecting populations of low socioeconomic status in developing countries (2). Most of the global malaria burden is found in sub-Saharan Africa, with most cases and deaths occurring in this region of the world, accounting for the majority (95%) of these cases (1). Nigeria (27%), the Democratic Republic of the Congo (12%), Uganda (5%), Mozambique (4%), and Niger (3%) accounted for about 51% of all cases worldwide (1). It harms human health and economic development in many developing countries, particularly in sub-Saharan Africa (1; 3; 4; 5).

The most common causes of human malaria are four species, namely *Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae, Plasmodium ovale,* and sometimes a fifth species, *Plasmodium knowlesi*, which is zoonotic (6). The most prevalent and pathogenic malaria parasite, most associated with serious illness and death, accounting for 99.7% of malaria cases in the African Region of WHO, 70.9% in Central America, 20.8% in South America, and 4.8% in Asia is *P. falciparum* (7). *Plasmodium falciparum* is responsible for most human infections, but *Plasmodium vivax* has the widest geographic range (8). Ethiopia, as one of these countries, suffers from this disease, which poses a problem for the country's health and economy. The prevalence of malaria in Ethiopia varies with climate, rainfall patterns, and altitude (9). A 2021 systematic review showed that the highest malaria prevalence was in the Southern Nations, Nationalities, and Peoples Region (SNNPR) (16.17%), followed by Oromia Regional State (13.11%) and Amhara Regional State (12.41%) (10) Tigray Regional State (13.11%), and Amhara Regional State (12.41%) (10).

As reported by EMIS 2015, the overall incidence of malaria in Ethiopia for all age groups residing in malarious areas was 0.5% when assessed through microscopy and 1.2% when evaluated using rapid diagnostic tests (RDT). By microscope, Gambella (6%) and Benshangul

Gumuz (3%) reported the highest incidence of malaria (11). By 2020, the Ethiopian Federal Ministry of Health (FMoH) hopes to have eradicated malaria in some regions with historically low rates of infection and have zero malaria-related deaths in malaria transmission areas (12).

According to records from the Ethiopian Federal Ministry of Health, 75% of the country's land area is affected by malaria, and 68% of the total population is at threat of malaria (13). That's more than 74 million of the country's population (13; 12). In Ethiopia, *Plasmodium falciparum* and *Plasmodium vivax* are the two predominant malaria parasites, which are distributed throughout the country and are responsible for 60% and 40% of malaria cases, respectively, and two main seasonal transmissions of malaria occur during the months September to December and March to May (14).

Malaria a completely preventable and treatable provided recommended measures are properly implemented. This includes vector control through the use of long-lived insecticide-treated nets (LLINs), Indoor Residual Spraying (IRS), and, in some specific settings, larvae control, chemoprevention for the most vulnerable populations, particularly pregnant women and infants, confirmation of malaria diagnosis by microscopy or rapid diagnostic tests (RDTs) for each suspected case and timely treatment with appropriate antimalarial drugs. According to the World Health Organization (WHO), strategic approaches to malaria control encompass two main areas: prevention and case management.

Accordingly, the World Health Organization recommends universal access to long-lived insecticide-treated nets (LLINs) (100%) and the use of household-level household nets and indoor residue spraying (IRS) >85% as the most powerful and effective vector control strategies to rapidly reduce malaria transmission, and the burden of malaria morbidity, and mortality (14).

Despite deliberate efforts to control malaria; it is still a challenging problem. It was also important to analyze the extent of the disease to fill in the gaps and strengthen the prevention and control intervention mechanism. This data analysis assesses the five-year Silte Zone malaria case reports, SNNPR; Ethiopia from 2018 to 2022 G.C. The study aimed to analyze the trends and extent of malaria in the Silte Zone. It show the changes from previous experience of cases to scale up malaria control efforts, the malaria burden, and the scale of the problems.

Methodology

Study area

Malaria surveillance data analysis conducted in the Silte Zone (Figure 23). The zone was administratively divided into 10 districts (locally called wereda) and five town administrations. There are 21 urban and 183 rural administrative kebeles (182456-house hold), and 894036 populations living in rural areas. The zone has 723,599 at-risk populations with 130 malaria kebeles and 147,673 malaria-prone households. Total health post 196, Functional health center (34), one comprehensive specialized hospital, three primary hospitals, 26 private medium clinics, three other clinics (polyclinic, university hospital and prison clinic)

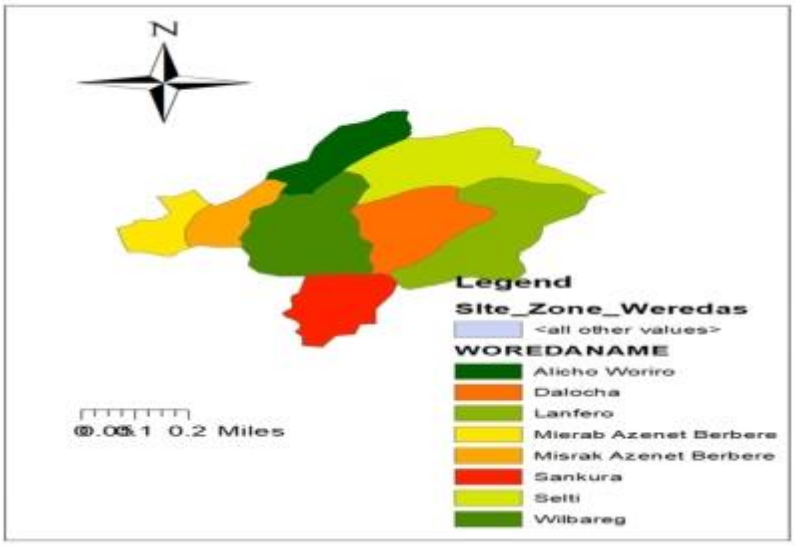


Figure 23: Map of Silte Zone, Southern, Nation, Nationalities Region, Ethiopia, 2023.

Study period

Secondary data of a total malaria cases and deaths of five years from Junly 2018 to June 2022 Silte Zone was collected, analyzed and interpreted.

Study design:

A retrospective surveillance data analysis design was implemented.

Source population: Total population at risk of malaria in the Silte Zone catchment area.

Study Population: Malaria cases in the Silte Zone in the last five years from 20118/2019 to 2021/2022.

Study unit: All individuals with suspected and confirmed case and deaths reported to the zonal health department were the study unit.

Sample size: All clinical and confirmed malaria cases reported between 2018 and 2022 were included

Data collection tools and process

Five years (2018-2022) of weekly surveillance data from Zone Public Health Emergency Management were collected. Before analysis, data were cleaned and checked for consistency, missing values, and miscoded values. Data analysis was carried out using Microsoft Excel 2010 to show malaria trend and clinical to describe malaria by place, person, and time. Using Arc GIS version 10.2 to show study area and special distribution. Also, age classification of cases and deaths identified from the Silte Zone communicable disease and control department.

Data quality management

The content completeness of all five years of secondary data were checked for their age, sex, and type of malaria species that were not recorded and were excluded from the analysis.

Data analysis

Microsoft Excel 2010 version was used to organize and analyze five years of weekly and monthly collected malaria surveillance data from 2018-2022. The nominator was the number of malaria cases from 2018–2022, and the denominator was demographic data of the population at risk of malaria in districts of Silte Zone. The incidence rates were calculated as malaria cases per 1000 population; malaria mortality was calculated as malaria deaths per 100,000 using at-risk population of the districts and zones. The population at risk was projected based on the 2007 Ethiopian Central Static Agency.

Data dissemination

A written report (in hard copy and soft copy) was prepared and distributed to the coordinators and advisors of the Ethiopia Field Epidemiology Training Program at Addis Ababa

University/School of Public Health, the Regional Health Bureau of the Southern Nation Nationalities Peoples Region, and the Silte Zone Health Department.

Results

Malaria morbidity and mortality

The average annual incidence rate of malaria over the past five years was 36,619 cases within a population of 3,574,770, resulting in an incidence rate of 10.14 cases per 1,000 individuals at risk each year. This statistic highlights the burden of malaria in the region, emphasizing the need for targeted interventions and effective public health strategies to reduce transmission and improve health outcomes (Figure 24).

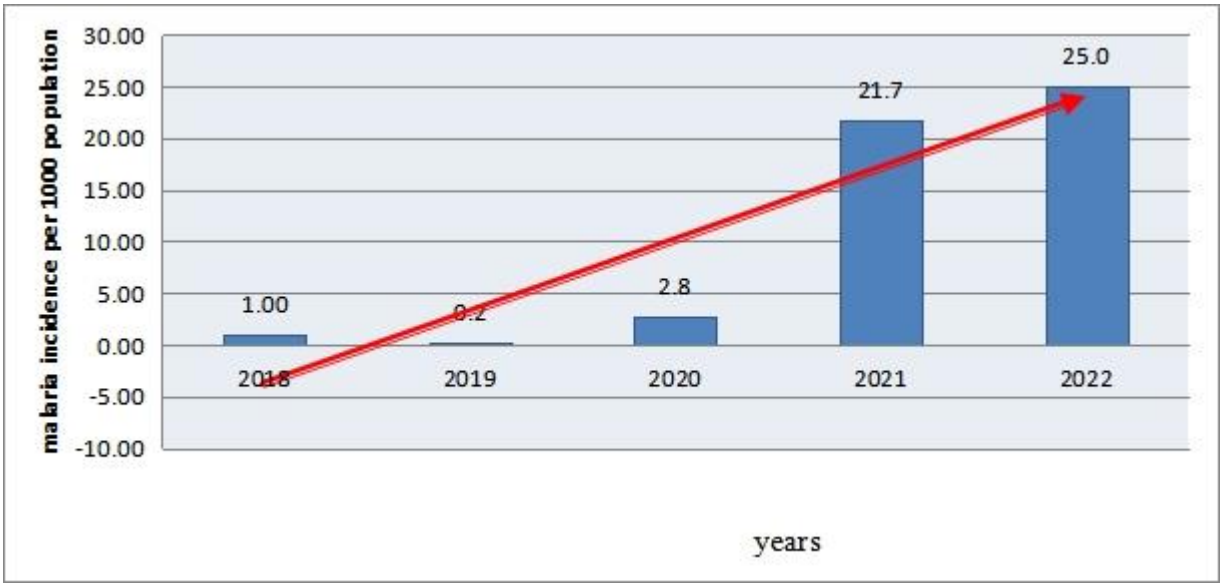


Figure 24: Trend of annual malaria incidence per 1000 in the Silte Zone, Southern, Nation, Nationalities, Region, Ethiopia from 2018–2022.

Malaria Test Positivity Rate: Among the total laboratory tests performed in the last five years, 32042 (87.5%) were blood smears (BF) and 4577 (12.5%) were rapid diagnostic tests (RDT). The mean test positivity rate for both RDT and BF over the past five years was 32.16 Percentage of cases due to *Plasmodium species* among confirmed malaria cases, *p. falciparum* and *p. vivax* were 62%, and 38% respectively (Figure 25).

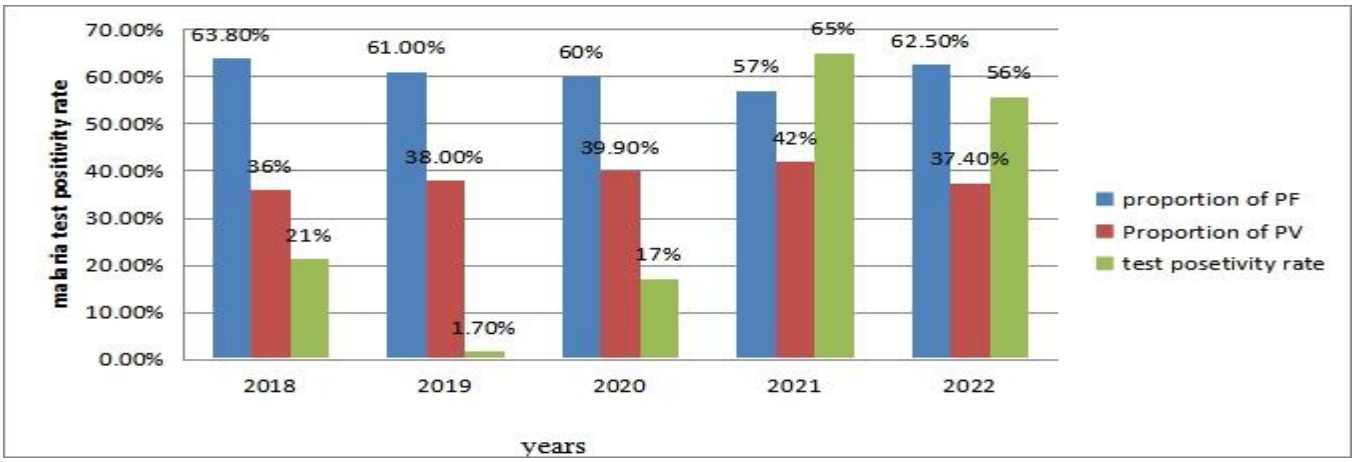


Figure 25: Trend of annual test positivity rate and plasmodium species in Silte Zone, Southern, Nation, Nationalities, Peoples Region, Ethiopia from 2018–2022.

The mean annual burden of malaria cases over the past five years was 12.81% Plasmodium falciparum and 7.2% Plasmodium vivax. The percentage of inpatient malaria cases was 0.045% of a total of 165 inpatient cases. Percentage of deaths: 0.01% of total 1 death, and pregnant malaria cases were 0.4% of total malaria cases. The mean annual estimated malaria case rate in inpatients was 0.045 per 10,000 populations at risk per year, while the malaria death rate in inpatients was 0.01 per 100,000 populations at risk per year. The estimated mean annual percentage of clinical malaria cases was 1.58% (Figure 26).

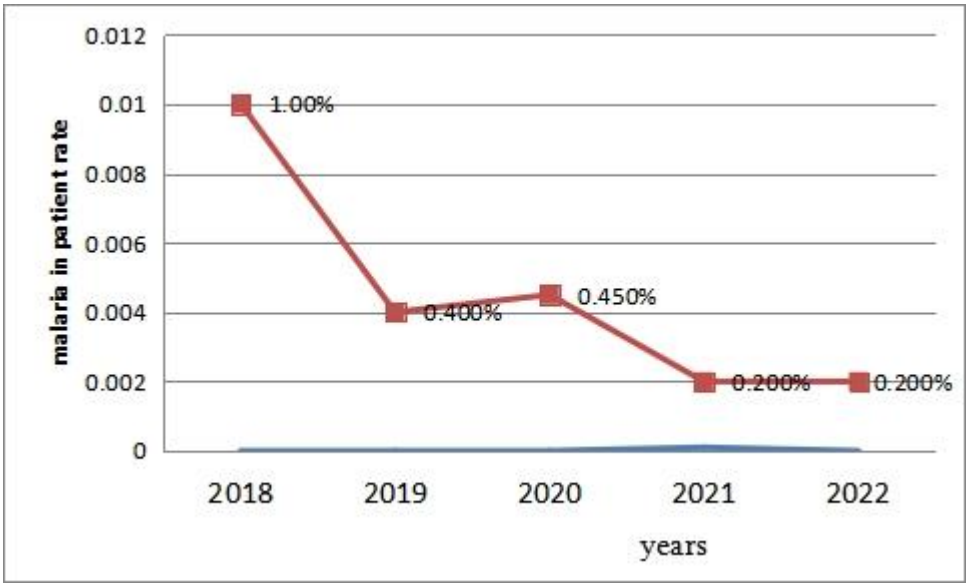


Figure 26: The trend of malaria mortality rates in the Silte Zone of the Southern Nations, Nationalities, and Peoples' Region (SNNPR) in Ethiopia from 2018 to 2022.

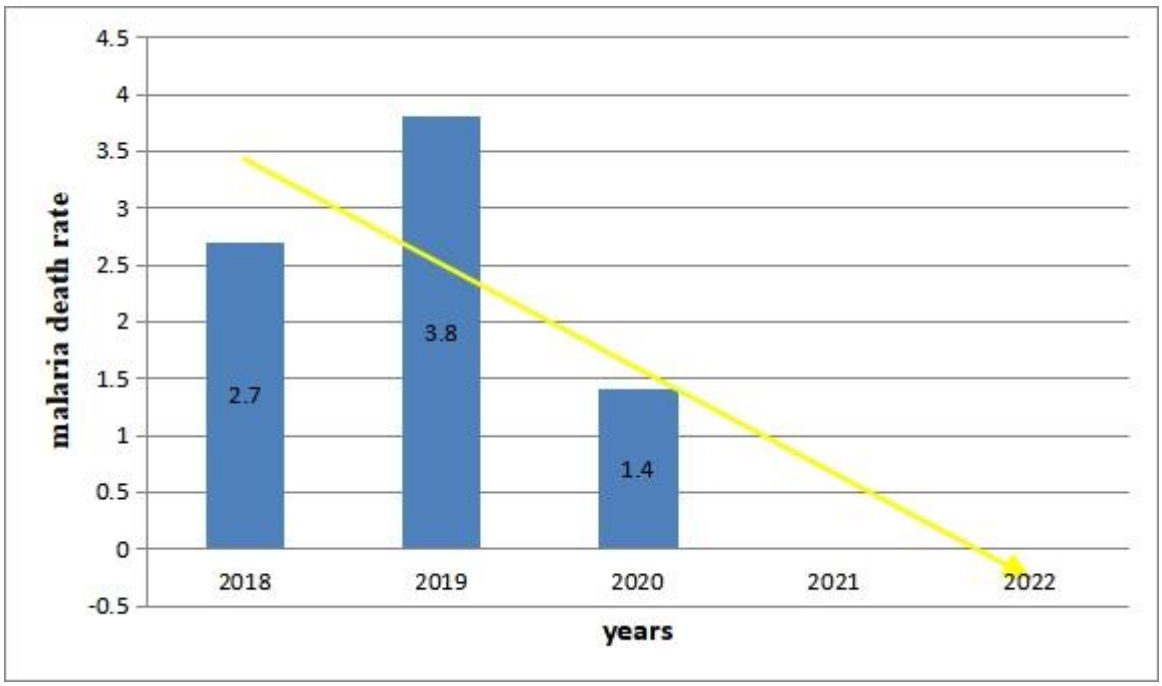


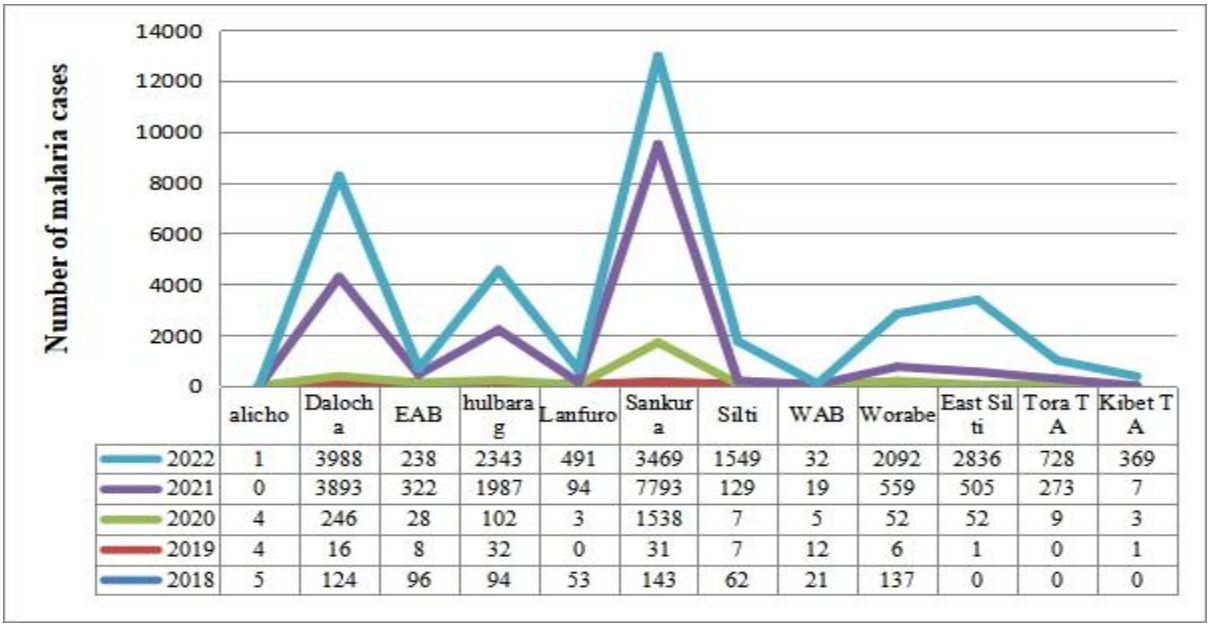
Figure 27: Trend of clinical cases in Silte Zone, SNNPR, Ethiopia from 2018–2022.

Malaria incidence by woreda and year

.During the 2018-2022 the majority of the cases were recorded in Sankura (35.4%) followed by Dalocha (22.5%) Hulbareg (12.4%) and East Silti (9.3%) and the lowest malaria cases were from Alicho (0.038%), WAB (0.24%) (Table 19).

Table 19 : Total malaria cases distribution by District in Silte in the Zone, Southern, Nation, Nationalities, Peoples, Region, Ethiopia, in 2018-2022.

district	Total malaria cases					Total cases n (%)
	2018	2019	2020	2021	2022	
ALicho	5	4	4	0	1	14(0.04)
Dalocha	124	16	246	3893	3988	8267(22.6)
EAB	96	8	28	322	238	692(1.9)
Hulbarag	94	32	102	1987	2343	4558(12.4)
Lanfuro	53	0	3	94	491	641(1.8)
Sankura	143	31	1538	7793	3469	12974(35.4)
Silti	62	7	7	129	1549	1754(4.8)
WAB	21	12	5	19	32	89(0.2)
Worabe	137	6	52	559	2092	2846(7.8)
East Silti	0	1	52	505	2836	3394(9.3)
Tora TA	0	0	9	273	728	1010(2.8)
Kibet TA	0	1	3	7	369	380(1)
zonal	735	118	2049	15581	18136	36619(100)



	alicho	Daloch a	EAB	hulbara g	Lanfuro	Sankur a	Silti	WAB	Worabe	East Sil ti	Tora T A	Kibet T A
2022	1	3988	238	2343	491	3469	1549	32	2092	2836	728	369
2021	0	3893	322	1987	94	7793	129	19	559	505	273	7
2020	4	246	28	102	3	1538	7	5	52	52	9	3
2019	4	16	8	32	0	31	7	12	6	1	0	1
2018	5	124	96	94	53	143	62	21	137	0	0	0

Figure 28: Five year malaria case trend, Hulbareg Woreda, Silte Zone, Southern, Nation, Nationalities, Peoples, Region, Ethiopia, in 2018-2022.

Malaria distribution by places vs. species

Of the total confirmed malaria cases, 36,619 were confirmed using both microscopy and rapid diagnostic tests (RDTs); of these, 22064 (64.2%) were P. falciparum and 14555 (35.6%) were P. vivax. Woreda with the highest p. falciparum species malaria cases were West Azernet Berbere 29 (92.1%), East Azernet Berbere 191 (80.3%), and Lanfuro 379 (77.1%), respectively. Woredas with the highest p. vivax cases were Sankura 3018 (87%), East Silti 1770 (62.4%), and Kibet TA 221 (60%) (Figure 29).

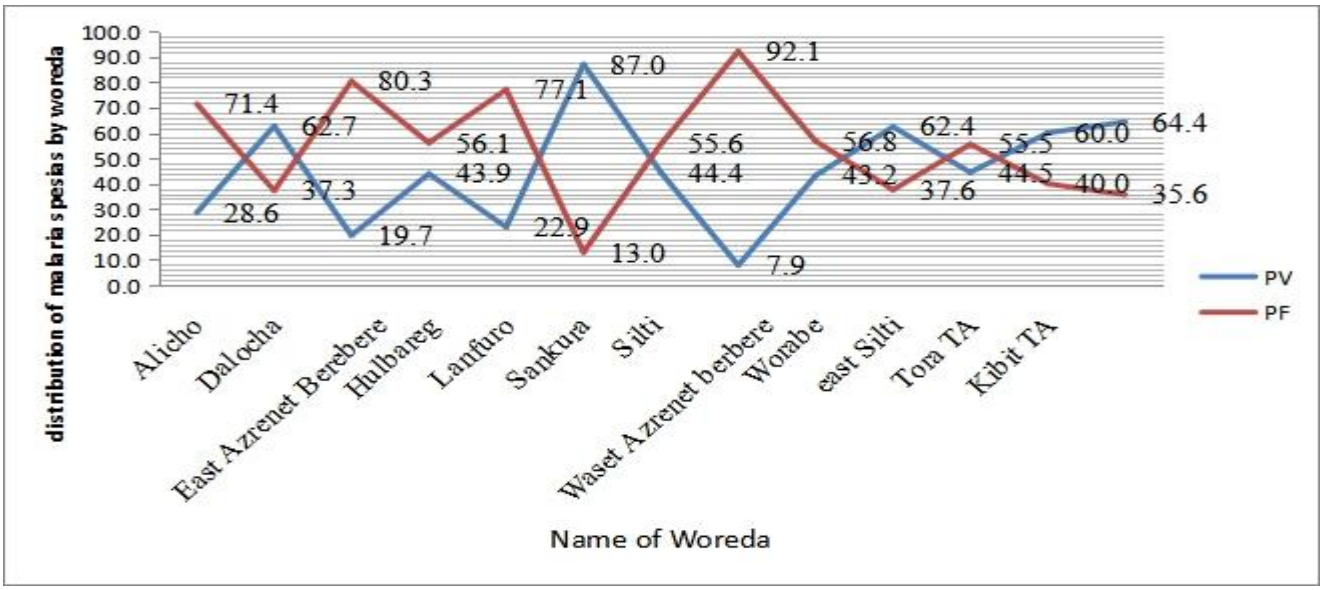


Figure 29: species of malaria distribution by Hulbareg Woredas in Silte Zone, Southern,Nation, Nationalities, Peoples Region, Ethiopia, 2018-2022.

Malaria distribution by person (Age and sex)

The disease prevention co-process report shows that the highest malaria cases were in the under-5 age group 13989 (38.2%), 5-14 age 9154 (254.9%), and age 13479 (36.8%). The report shows that the more affected age group was less than five years old.

Table 20: malaria incidence by age group and gender in Silte Zone, SNNPR-Ethiopia from 2018-2022.

	under-5 years			5-14 years			>=15 years		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
confirmed cases	7946	6043	13989	5044	4110	9154	6873	6603	13476
total case	7946(56.8%)	6043(43%)	13989	5044(55%)	4110(44%)	9154	6873(51%)	6603(49%)	13476
age category	under-5 years			5-14 years			>=15 years		
total malaria case	13989(38.2%)			9154(24.9%)			13476(36.8%)		

Since malaria is not an age-specific disease, all age groups are at danger of malaria. In the past five years, cases of malaria have been observed in both under-five and older children.

Malaria affects both sex, but magnitude of cases in both sexes was different (see figure 30 below).

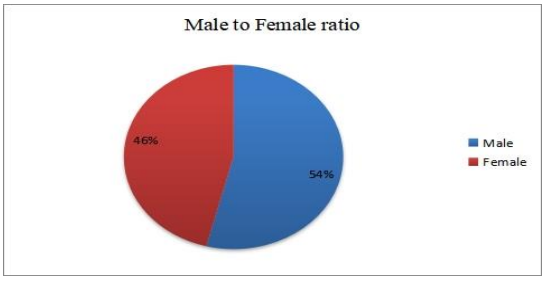
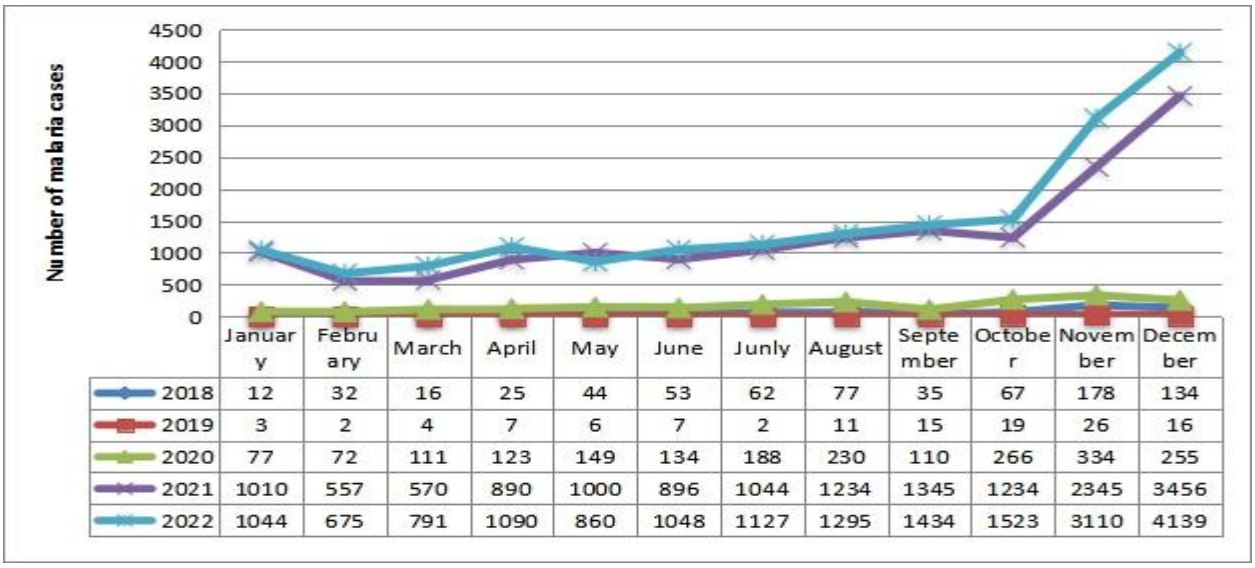


Figure 30: Malaria case distributions by sex, Silte zone, Southern, Nation, Nationalities, Peoples Region-Ethiopia 2018-2022.

The study found that the biggest malaria transmission peaks occur between September and December after heavy rains, with the second peak occurring in May after modest rains in March and April. However, malaria cases in the silt zone increased dramatically from October to December in 2021 and 2022 (Figure 31).



	Januar y	Febru ary	March	April	May	June	Junly	August	Septe mber	Octobe r	Novem ber	Decem ber
2018	12	32	16	25	44	53	62	77	35	67	178	134
2019	3	2	4	7	6	7	2	11	15	19	26	16
2020	77	72	111	123	149	134	188	230	110	266	334	255
2021	1010	557	570	890	1000	896	1044	1234	1345	1234	2345	3456
2022	1044	675	791	1090	860	1048	1127	1295	1434	1523	3110	4139

Figure 31: Malaria distribution by case by season in Silte zone, Southern, Nation, Nationalities Peoples, Region-Ethiopia from 2018-2022.

ITN Distribution

Since 8 Woreda in the zone are affected by malaria, insecticide net distribution is very important to protect people from mosquitoes as a physical barrier. It can be used for a period of three to five years. In the Silte zone, the ITN distribution in recent years occurred in two years 2019 and 2022, the GC. ITN coverage of the zone was 99% and 84% respectively (Figure 32)

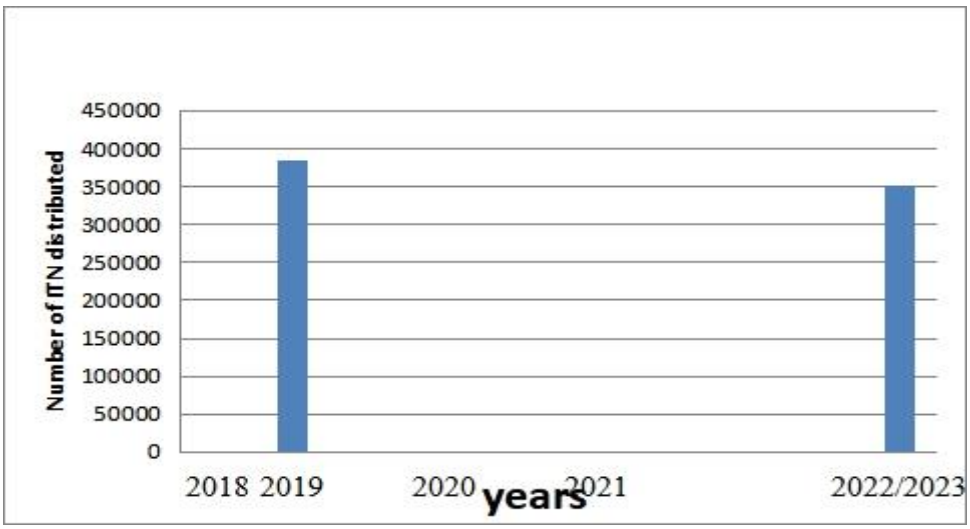


Figure 32: ITN distributions in the past 5 years Silte Zone, Southern, Nation, Nationalities, Peoples, Region-Ethiopia 2018-2022.

ITNs utilization

An Assessment was done at the end of 2022 GC for insecticide threatened net availability and utilization at household level, and the result shows most of the people were not used the net at least for recommended period of time that is for three to Five years(Figure 33).

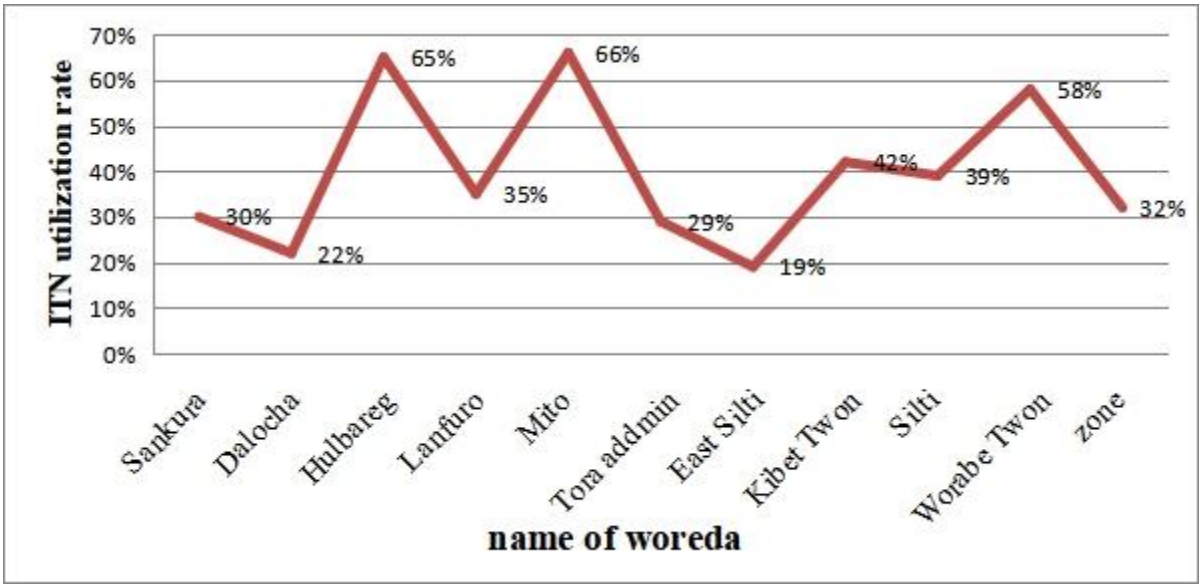


Figure 33: Trend of ITN utilization and availability in Silte Zone, Southern, Nation, Nationalities, Peoples. Region-Ethiopia 2022.

Indoor residual spray (IRS)

Indoor residual spray is one of the malaria control and prevention mechanisms that is experienced in most malarious areas year to year (Table 21).

Table 21: Indoor Residual Spray by Woreda, Silte Zone, Southern Nation Nationalities Peoples Region, Ethiopia, 2018-20222.

S/N	Wereda	# kebele	# population protected	HHs	Unit structure	Coverage
1	Hulbareg	1	10,661	2176	3,940	97%
2	East Silti	2	3851	786	1179	98%
3	Sankura	24	60140	12273	20384	93%
4	Werabe	2	1825	372	597	93%
5	Dalocha	7	25007	5103	11791	91%
	Zone	36	101484	20710	37991	94%

Discussions

In this study, the overall clinical and confirmed estimated mean annual malaria prevalence rate was 10.14 per 1000 population at risk per year in the five years before the study; It was lower than the prevalence rate compared to the annually Southern Nations, Nationalities, and Peoples Region (SNNPR) (16.17%), followed by Oromia Regional State (13.11%) and Amhara Regional State (1), but higher than the rate from EMIS 2015, Gambella (6%) and Benshangul Gumuz (3%) region (2), malaria surveillance data analysis in Ethiopia (1), and Butajira district (3).

The higher rate in the Silt Zone could be due to differences in geographic and climatic conditions. In the districts, the average annual malaria prevalence rates over the past five years were high in Dalocha and Sankura Woreda and low in Alicho Wuriro Woreda and Misrak Azernet Berbere Woreda, and the remainder were moderate, based on the National Malaria Strategic Plan 2014–2020 (4). The maximum number of malaria cases in 2021-2022 could be due to the inconsistent implementation of malaria prevention and control strategies and the rise of COVID-19 in the study area. The radical decline in 2018-2019 may indicate that there was collective action by stakeholders to raise awareness, increase budgets, and implement malaria prevention and control strategies. The average annual inpatient malaria cases and death rates were lower than the result of malaria surveillance data analysis in Ethiopia (1). This could be an improvement in early detection and treatment of malaria control and prevention strategies. In this study, the predominant reported species was *P. falciparum* 22064 (60.2%), followed by 14555 (43.8%) P. vivax. This study is similar to study conducted in Ethiopia which found that P. falciparum (60%), *P. vivax* (40%) (5) Hadiya Zone and (4), and butajera (6).

The dominance of *Plasmodium species* was not constant over the years, although a consistent increase in trends from 2019 to 2022 was observed for Plasmodium falciparum. This could be due to the consistency of malaria prevention methods in the areas and increasing behavior towards drug resistance. The transmission of malaria is usually associated with rainy seasons, malaria cases in the present study were similar in season (7) above as well. This study shows that malaria cases were more frequently male (54.2%) than female (45.8%). Since most of the population income depends on agriculture, people are mainly engaged in agricultural activities and other large projects. They could spend the night with their possessions and farm produce. This can leave them easily exposed to malaria vectors. Regarding the distribution of the

estimated annual malaria prevalence rate by age group over the past five years, the majority of reported cases were in the age group <5 years, in contrast to the study conducted in the Wolaita zone. Southern Ethiopia (8). This may be because children living in poverty/malnutrition and with low immunity are more susceptible to malaria than other age groups. The mean annual test positivity rate (microscopic and RDT) in the Silte Zone was the highest (36.12%) compared to the study conducted in the Wolaita Zone, Southern Ethiopia (8), in the Hadiya Zone (4) and in the Bata District, Equatorial Guinea (9). Of the total confirmed malaria cases, the most commonly reported species was P. falciparum, in line with the national malaria guideline(10), the 2014/2015 health-related indicator(2), the malaria surveillance data analysis(5), and the study conducted in the Wolaita zone (8). However, this is in contrast to the study conducted in Hadiya zone(4) and Butajira district in Central Ethiopia (6).

A trend of significant sharp increases in malaria cases has been observed over the years, this finding indicate that the Zone has failed to meet both global and national goals of reducing malaria and accelerating progress towards elimination. Achieving the goal requires access to care for suspected cases of malaria and adequate diagnostic testing and therapeutic management at all points of care, to ensure that all patients with malaria receive prompt and effective treatment, and to ensure the availability and use of long-acting insecticides Nets (LLINs) are powerful vector control tool to reduce malaria transmission. Improving the malaria detection and skills of laboratory personnel and expanding other malaria control and prevention activities are very important to greatly reduce the burden of malaria in the study area (10).

Limitations of the study

- Secondary surveillance data on malaria incidence may be incomplete, inaccurate, or limited, potentially underestimating the true magnitude of the disease.
- Validating malaria control and prevention strategies in the community, such as LLIN use rate and IRS spray status, has proven challenging.

Conclusions

The study reveals a rise in zonal malaria burden over the past three years, with a trend of confirmed community cases. However, clinical diagnosis of malaria cases remained near zero. Expanding interventions like early diagnosis and immediate treatment significantly reduced inpatient malaria cases and mortality. However, poor performance of effective interventions, such as LLINs, and low ITN usage rate necessitates strengthening intervention activities and surveillance.

Recommendations

- Surveillance data lacking personal attributes such as age and gender makes individual analysis difficult, thus including these variables is beneficial.
- Enhance preventative and control activities, especially in the Silt Zone.
- To strengthen community health education in the proper use of the long-lived insecticide-treated net.
- The zone health department should conduct the monitoring and documentation of LLIN use.
- The health department should increase malaria interventions, strengthen health systems, and make significant efforts to decrease its impact.

Referances

1. kitaw TA, Haile RN. Prevalence of polypharmacy among older adults in Ethiopia: a systematic review and meta-analysis. Sci Rep. 2023;13(1).
2. Anekwe T, Barofsky J, Farzadfar F, Chase C. The economic effects of malaria eradication: Evidence from an intervention in Uganda. Progr Glob Demogr Aging. 2011;(70).
3. Access O. Prevalence of malaria infection in Butajira area ,. 2012;1–8.
4. FMOH. National Malaria Control Program Monitoring and Evaluation Plan 2014-2020. Draft v14 [Internet]. 2014;(June):1–43. Available from: papers2://publication/uuid/5F7F5ACD-D77C-4B46-AE26-40712DCC111C
5. World malaria report 2018. 2018.
6. Woyessa A, Deressa W, Ali A, Lindtjørn B. Malaria risk factors in Butajira area , south-central Ethiopia : a multilevel analysis. 2013;1–10.
7. Mace KE, Lucchi NW, Tan KR. Malaria Surveillance — United States, 2017. MMWR Surveill Summ. 2021;70(2):1–35.
8. FMOH. NATIONAL MALARIA GUIDELINES, Third Edition. Ministry of Health of Federal Democratic Republic of Ethiopia. Addis Ababa,Ethiopia. 2012;(January):54–7.
9. Legesse Y, Tegegn A, Belachew T, Tushune K. Knowledge, Attitude and Practice about Malaria Transmission and Its Preventive Measures among Households in Urban Areas of Assosa Zone, Western Ethiopia. Ethiop J Heal Dev. 2007;21(2):1–9.
10. FMOH. National Malaria Guidelines, Fourth edition. Natl Malar Giuideline. 2017;3rd(November):1–108.

5.2. Assessment of Utilization of Insecticide Treated Bed Nets among Pregnant Women and Associatived Factors in Rural Kebeles of Hulbareg Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, 2024.

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Abstract

Background: Insecticide-treated nets (ITNs) are commonly used to prevent and control malaria. Malaria infection during pregnancy endangers the pregnant lady, the fetus, and the newborn baby. Thus, using an insecticide-treated net (ITN) is one of the most commonly recommended techniques for malaria prevention during pregnancy.

Objectives: To assess the Utilization of insecticide treated-nets and associated factors among pregnant women in Hulbarage Woreda.

Methods: A mixed-method community-based cross-sectional study was carried out from January 2 to February 29, 2024, in Hulbareg, Woreda. A systematic random sampling technique was employed to select a total of 505 households with pregnant women for the quantitative component of the study. Data for the qualitative component were gathered from 12 pregnant women via focus group discussions and subsequently analyzed through a thematic approach. Quantitative data were obtained using a pretested questionnaire. Data were inputted and examined utilizing the Statistical Package for the Social Sciences software. Bivariate analysis was employed to determine the associations between independent variables and the dependent variable. The multivariate logistic regression model incorporated variables that exhibited a p-value of less than 0.025 in the bivariate analysis, along with a 95% confidence interval for determining significance.

Result: 505 pregnant were participated in the study and about 51% of the participants were at the age of 26 to 35 followed by 36 to 35 age group(21%) and 18 to 25 age group (20%). Of the total respondents, 56% of them utilize insecticide-treated nets. The existance of mosquito breeding sites around house (AOR=1.78, CI:1.105-2.890), family size (4 to 6 members, AOR=0.588, CI:0.3.23-1.069),>6 members, AOR=0.284, CI: 0.047-1.338), educational status (primary AOR = 1.280, CI: 0.569-3.466, high school AOR=2.195, CI: 1.071-4.529), 6 to the last month gestation age of the pregnancy (AOR=0.146, CI: 0.089-0.240), and perception of using ITN doesn't cause any problem (AOR=3.58 CI:2.034-6.156) were found to have a statistically significant association with utilization of ITN among pregnant women.

Conclusion: About 56% of the pregnant women utilized insecticide treated nets (ITNs), which is less than the national target. The need to employ insecticide-treated nets (ITNs) must be made clear to communities and health extension workers. The government and other concerned bodies should give priority to educating pregnant mothers regarding proper utilization of ITNs including during pregnancy.

Introduction

Background

Malaria infection in pregnant women presents considerable health challenges for the unborn child, fetus, and mother herself. It can lead to various complications including intrauterine growth restriction, anemia, low birth weight, and parasitemia (1). Pregnancy-associated malaria is a recognized medical emergency that requires hospital treatment to prevent complications and maternal deaths (2,3). Pregnant women face a twofold increase in the risk of mortality from malaria and are three times more susceptible to experiencing severe malaria compared to non-pregnant women (2).

Pregnant women and children under five are significantly more likely to experience a serious illness(1). Utilizing insecticide-treated nets is among the most effective methods for preventing malaria in pregnant women (4,5). If the insecticide-treated net is used properly and regularly, it lowers contact and infective mosquito bites by roughly 70%–90% (6). Research has demonstrated that utilization of insecticide-treated nets (ITNs) in regions where malaria is endemic can lead to a reduction in malaria-related death by approximately 20% (7,8). Gamble et al's five randomized controlled studies reveal that insecticide-treated nets (ITNs) can significantly reduce placental parasitaemia, low birth weight, miscarriages, stillbirths, and malaria-related anemia (9).

Even though the majority of sub-Saharan African nations have adopted the WHO guidelines for malaria prevention, the coverage of insecticide-treated nets (ITNs) among pregnant women continues to be inadequate, leaving 28 million pregnant women without access to insecticide-treated nets (ITNs) services. Similarly, in Ethiopia, only 13 to 51.4 % of pregnant women use insecticide-treated nets (ITNs), (10,11), and factors related to utilization of insecticide-treated nets varied between studies (10,12,13). Ethiopia's government prioritizes identifying awareness gaps, monitoring behavioral changes, and implementing preventive measures like ITNs for malaria control (14,15).

Malaria is endemic in Hulbareg Woreda; however, there is a lack of data regarding the utilization of insecticide-treated nets (ITNs) among pregnant women. This study aims to assess insecticide-

treated net utilization among pregnant women in Hulbareg Woreda. This research seeks to evaluate the usage of insecticide-treated nets among pregnant women in Hulbareg Woreda. Consequently, the findings of this study are expected to be beneficial for policymakers and other stakeholders in making informed recommendations and promoting the increased utilization of ITNs.

Methods and materials

Study Area

This community-based cross-sectional study employing mixed methods was conducted in Hulbareg Woreda, located approximately 188 kilometers southwest of Addis Ababa along the route of the Hossana Town. The woreda's estimated total population for 2023 was 94,223 based on projections from the 2007 national census, of which 46,622 (49.5%) were male and 47,601 (50.5%) female populations (16). In Woreda, there were 3261 (3.4%) urban dwellers. 3260 pregnant women, or 3.46% of the total Woreda population, in Hulbareg Woreda was organized into 11 Kebeles, comprising of one urban Kebele and ten rural Kebeles. The Hadiya Zone borders the Woreda to the southwest; Misraq Azernet Berbere borders it to the west; Alicho Werero borders it to the north; Silte borders it to the northeast; Dalocha borders it to the east; and Sankurra borders it to the south.

Hulbareg Woreda has two main agroecological zones: "dega" (cool temperate highlands above 2,300 meters) and "kolla" (lowlands between 1500 and 2300 meters). The average annual temperature is 21 degrees Celsius, with 1200 mm of rainfall.

The Woreda has 41 permanent and 1,436 transient mosquito breeding sites, eleven health posts, four health centers, three medium clinics, three primary clinics, three rural drug vendors, and one private health facility, Health Service coverage was 100% of the area in 2022 (17).

The 2015 EFY malaria caseload in Hulbareg Woreda was 26104, with 4416 positive cases (16.9%). The most common plasmodium species was PF, accounting for 2870 cases, and PV for 1546. The annual incidence of parasitic malaria was 47.8/1000 people, with Anopheles arabiensis being the main vector(17).

In 2021, 32,900 ITNs were distributed and IRS was sprayed in Hulbareg Woreda, as part of a malaria prevention strategy, alongside early diagnosis and treatment (17).

Five of the ten rural kebeles in the Hulbareg Woreda of the Silte Zone, in the Central Ethiopia Region Bilewanija kebele, Demeke kebele, Achamo kebele, Gimba kebele, and Tode kebele were the subject of this study.

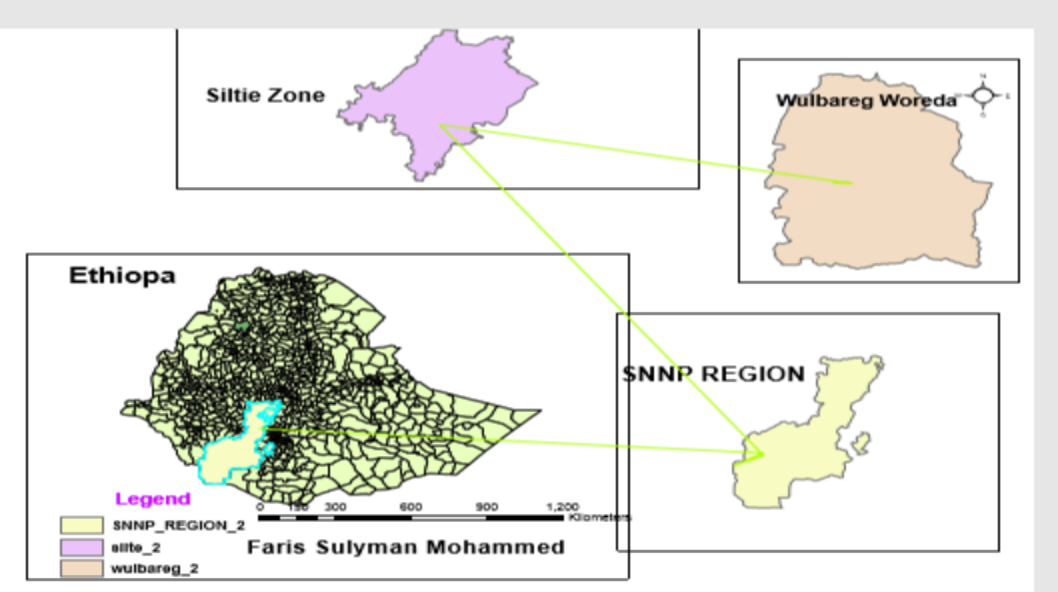

Figure 34:-Map of Hulbareg Woreda, Silte, Zone, Central Ethiopia Region, Ethiopia, 2024.

Study design and period

Study period

The study was conducted between January 2 and February 29, 2024, GC.

Study design

A community-based cross-sectional study utilizing a mixed-method approach was conducted, with data gathered through interviewer-administered pretested structured questionnaires in rural Kebeles of Hulbareg Woreda, in the year 2024.

Population

Source Population

All pregnant women living in the rural kebeles of Hulbareg Woreda.

Study Population

For the quantitative part: The study population consisted of randomly selected pregnant women from Hulbareg Woreda.

For the qualitative part: The study population was comprised of pregnant women who were randomly selected to participate in focused group discussions in Hulbareg, Woreda.

Sampled population

All selected pregnant women from January 2–February 29, 2024.

Inclusion &exclusion criteria

Inclusion criteria

All pregnant women who owned at least one ITN(s), and who lived for at least six months in the District.

Exclusion criteria

All pregnant women who experienced illness during the data collection period and were unable respond were excluded from the study.

Sampling technique and procedure

This study used systematic random sampling. Five rural kebeles were chosen using the SRS technique (lottery method) out of the ten rural kebeles in Hulbareg Woreda to represent all rural kebeles in the study area (Figure 35).

Each kebele was assigned a probability-proportional sample size based on the total number of households with pregnant women. A sampling frame of pregnant women's households was generated based on their identification and registration for ANC follow-up at their respective

health posts. Finally, 505 houses with pregnant women were selected using a rigorous, systematic sampling of study participants (Table 22).

Sample size determination and sampling procedure

Sample size calculation for the first objective

A single-population formula was used to calculate the sample size. The Damota Pulasa district in southern Ethiopia was used to calculate the population proportion, p, where p is the proportion of households that use ITNs for pregnant women assuming they sleep under a net, and p = 0.725 (13).

The following formula was used.

$$n = \frac{(z\alpha/2)2*p\ (1-p)}{d^2} \qquad n = 3.8416*0.725*0.275/0.0025 = 306$$

Where:-

n= Sample Size

CI=95% (confidence interval).

d = 5% (Margin of Error))

Then, 306*1.5(Design Effect) = 459, and by adding 10% non-response rate = 505.

Calculate the sample size for the second objective.

It was calculated by using Epi.info, a study findings obtained from Adama Woreda, Oromia Ethiopia (factors associated with insecticide-treated nets utilization among pregnant women) (18)

Table 22: Shows the factors associated with the utilization of insecticide-treated nets among pregnant women.

s/no	Variables (associated factors)	CI	AOR	% of exposed	Power (80)	Design Effect	Non-response rate	Final sample size
1	ITN Ownership	95%	2.42	50.9	80	1.5	10%	314
2	Lack of information ITN	95%	2.61	52.8	80	1.5	10%	267
3	Knowledge of ITN	95%	3.14	57.4	80	1.5	10%	**122**

The sample size determined for objective one 505 was considered the largest; hence, it was the final sample size for the study.

Table 23: Distribution of sample size by kebele for the use of insecticide-treated nets and associated factors among pregnant women, Hulbareg Woreda in the Silte Zone, Central Ethiopia Region, 2024.

S/N	Name of kebeles	Kebeles Population	Number of PW (3.46%)	Sample size per selected kebeles (30.3% of PW)
1	Bilewanija	11,630	402	122
2	Demeke	10679	369	112
3	Tode	8452	292	88
4	Ambericho Gimba	8180	283	86
5	Amberich Achamo	9236	320	97
	Total	48177	1667	505
	PW = Pregnant Women			

The proportion-to-size stratum sampling method was ultimately employed to ascertain the number of pregnant women to be interviewed in each kebele, by dividing the overall sample size of 505.

Sampling procedure

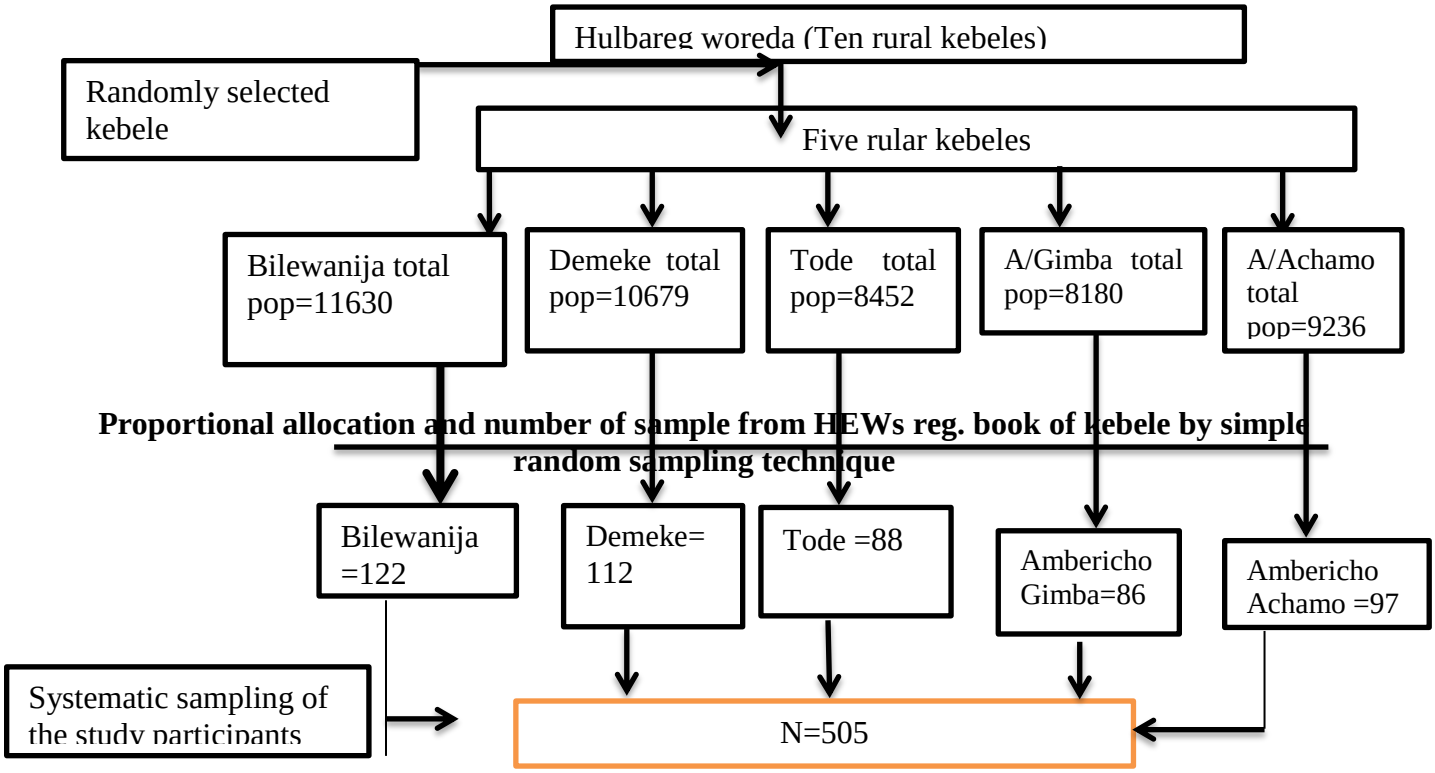

Figure 35:- Schematic representations of sampling technique for utilization insecticide-treated net (ITNs) among pregnant women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, 2024.

Adapted from various sources with some modifications (13,19)

Variables of Study

Dependent variable

- Utilization of ITNs by pregnant women

Independent Variables

- Socio-demographic factors
- Sex
- Age
- Marital status
- Household size
- Occupation
- Residence

Environmental factors

- Types of house structure
- Breading site

Knowledge and organizational factors

- Knowledge of malaria
- Knowledge of ITNs
- Information of ITN

Other factors in the home

- Availability of space for ITN hanging
- Number of ITN in the household
- Experienced fever due to malaria

Operational Definitions

Pregnant women: refers to individuals experiencing a maternal condition characterized by the presence of a developing fetus within the uterus. The survey indicated that these individuals were identified as pregnant. (13).

Insecticide-treated nets (ITN): any long-lasting insecticidal net (LLIN) designed to kill, repel, or block mosquitoes physically that has been planned to remain effective for more than three years without retreatment (20).

ITN utilization: is characterized by the positive responses of study participants indicating that they slept under the ITN on the night before the day of data collection (12,14).

Proper utilization of ITNs: involves properly suspending and positioning them around the mattress to prevent the ingress of mosquitoes (13).

Proper hanging of ITN: hanging and putting insecticide-treated nets (ITNs) all around a mattress with no entry for biting mosquitoes (13).

Good knowledge: number of mothers who responded above the average of knowledge questions (13).

Data collection tools and procedures

Data were gathered through both quantitative and qualitative methods utilizing pre-tested questionnaires. The questionnaire was developed using the independent variable from the literature and adapted from other prepared questionnaires (21). The questionnaire was initially developed in English, subsequently translated into the local language, Amharic, and then translated back into English to verify its consistency. An open-ended question focusing on the use of ITN and its related factors was employed for the qualitative component.

A total of six health workers holding diplomas were engaged in the data collection process, while one supervisor with a degree was employed to oversee the data collection activities. Training sessions spanning two days were conducted for data collectors and the supervisor, focusing on the objectives of the study and the methodologies for data collection. For qualitative, FDGs were also used, which included 12 pregnant mothers.

Data quality control

Data collectors and supervisors were trained in data collection methods, while experienced researchers ensured the validity of the checklists. Daily checks were conducted to ensure data completeness and consistency, and any incomplete data were removed. Data cleaning was carried out, followed by a pretest involving 5% of the total sample from rural Kebeles.

Data processing and analysis

To evaluate the related factors, descriptive statistics were performed, and both bivariate and multivariate logistic regressions were carried out. Frequencies and cross-tabulations were utilized with the software to look for variables and values that were overlooked. To determine which variables are specifically related to the dependent variable, a bivariate analysis was employed. Only variables with a p-value of less than 0.025 from the bivariate analysis were incorporated into the multivariate logistic regression model, which limited the total number of variables considered. P-values below 0.05 were regarded as significant in all analyses and are presented as adjusted odds ratios (AOR) along with 95% confidence intervals.

Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) at the Addis Ababa University College of Health Sciences, School of Public Health, prior to data collection. The privacy of the respondents and the confidentiality of their information were protected.

All study participants were informed during data collection that their participation was voluntary and that they could withdraw their consent at any time, even after the interview had started. Participants were provided with the principal investigator's contact information for any inquiries. Data collection was conducted using codes, ensuring that no names or personal identifiers were requested, and all sensitive information was kept confidential.

Dissemination of findings

The results were shared with the School of Public Health at Addis Ababa University (AAU). Subsequently, efforts were made to present the findings at the Central Region Health Bureau's annual and biannual meetings, as well as other regional gatherings on malaria. Additionally, there were initiatives to present the findings at scientific conferences and pursue publication. Reports were distributed to the Central Ethiopia Region Health Bureau, the Silte Zone Health Department, the respective Woreda health office, the AAU School of Public Health, and the sponsoring organization.

Qualitative part

Methodology

This study aims to investigate the use of insecticide-treated nets among pregnant women through a focus group discussion (FGD) approach. The FGD method was selected because it facilitates an in-depth exploration of participants' experiences, perspectives, and practices related to ITN usage during pregnancy.

Participant selection

Twelve pregnant women were selected to participate in the focus group discussion. Participants were recruited through purposive sampling, targeting pregnant women who have both used and not used ITNs. Efforts were made to ensure diversity among participants in terms of age, socio-economic status, and educational background, allowing for a broader range of perspectives.

Data collection procedure

The focus group discussion was conducted in a comfortable and private setting, ensuring confidentiality and creating an open atmosphere for discussion. The session lasted approximately 1.5 to 2 hours. A trained moderator was facilitated the discussion, while a note-taker was documented key points.

The discussion followed a semi-structured interview guide developed specifically for this study. The guide included open-ended questions and prompts, enabling participants to share their experiences, perceptions, and challenges regarding the use of insecticide-treated nets (ITNs) during pregnancy. The moderator encouraged participants to provide detailed responses.

Data Analysis

The focus group discussion was recorded, transcribed verbatim, and analyzed using thematic analysis. The transcripts were reviewed multiple times to identify recurring themes, patterns, and insights related to ITN utilization among pregnant women. This analysis involved coding the transcripts and organizing the data into meaningful themes. Data saturation was used as a criterion to assess the adequacy of the sample size.

Ethical consideration:-

Ethical considerations were rigorously addressed throughout the study. Informed consent was obtained from each participant, providing a clear explanation of the study's purpose, their rights, and the voluntary nature of their participation. Participants identities were randomized throughout the study, and their confidentiality was maintained during data collection, analysis, and reporting. The study protocol was reviewed and approved by the appropriate research ethics committee.

Results

This section comprises of two parts: descriptive and inferential results. The descriptive results provide an overview of the socio-economic, demographic, and environmental variables of the study participants.

Quantitative part

Socio-demographic Characteristics of the Study Participants

In this study, a total of 505 pregnant women were included and interviewed. However, five participants could not complete the interview due to personal issues, resulting in 500 responses being included in the final analysis. This yields a response rate of 99%.

Regarding the age of the respondents, among those aged 18 to 25, 24.1% reported using insecticide-treated nets (ITNs), while 15.3% did not, representing 20.2% of the total participants. In the 26 to 35 age group, 65.1% use ITN, with 50.9% not using it, totaling 58.8% of the respondents in this age group. For respondents aged 36 to 45, 10.8% use ITN and 33.8% don't, constituting 21.0% of the total respondents (Table 24).

Regarding the education status of the respondents, of those with no education, 28.1% use ITN, and 64.4% don't, making up 44.2% of the total participants. Respondents with primary education: 64.4% use ITN, 30.6% don't, totaling 49.4%. High school educated: 7.2% use ITN, 5.0% don't, making up 6.2% of the total. Only one respondent with education above grade 12 has participated in this research, and she is found to use ITN.

Regarding the main occupation of the respondents, among governmental employees, 3.2% use ITN, while 0.9% don't, making up 2.2% of the total respondents. Of respondents whose main occupation is housewife, 84.5% use ITN and 84.7% don't, totaling 84.6%. Among pregnant women who are mainly engaged in trading, 12.2% use ITN and 14.4% don't, making up 13.2% of the total.

In terms of family size, among families with fewer than 3 members, 25.9% reported using insecticide-treated nets (ITNs), while 23.4% did not, accounting for 24.8% of the total respondents. In families with 4 to 6 members, 67.6% of them use ITN, while 45.0% of them

don't, totaling 57.6%. In families with more than six members, 6.5% use ITN and 31.5% don't, constituting 17.6% of the total.

Table 24: Socio-Demographic Characteristics of Pregnant Women in Hulbareg Woreda, Central Ethiopia Region, Ethiopia, 2024

Variables	Response categories	Using ITN		Not using ITN		Total	
		Count	Percent	Count	Percent	Count	Percent
Age category of the respondent	18 to 25		24.1	34	15.3	101	20.2
	26 to 35	181	65.1	113	50.9	294	58.8
	36 to 45	30	10.8	75	33.8	105	21.0
Education status of the respondent	No education	78	28.1	143	64.4	221	44.2
	Primary	179	64.4	68	30.6	247	49.4
	High school	20	7.2	11	5.0	31	6.2
	Above 12	1	0.4	0	0.0	1	0.2
Main occupation of the respondent	Governmental Employee	9	3.2	2	0.9	11	2.2
	House wife	235	84.5	188	84.7	423	84.6
	Merchant	34	12.2	32	14.4	66	13.2
	Farmer	0	0.0	0	0.0	0	0.0
Family size	Less than 3	72	25.9	52	23.4	124	24.8
	4 to 6	188	67.6	100	45.0	288	57.6
	Greater than 6	18	6.5	70	31.5	88	17.6

Respondent characteristics and utilization of ITN

Regarding the utilization of insecticide-treated nets (ITNs), as illustrated in Figure 36 below, approximately 56% (278) of the respondents reported using ITNs, while 44% (222) did not.

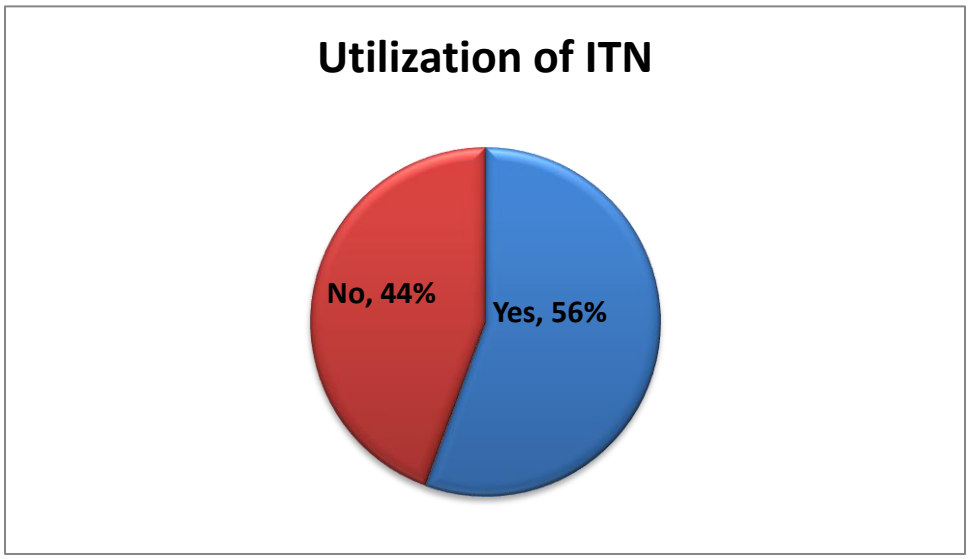

Figure 36: Utilization of ITN Among Pregnant Women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, 2024.

The information gathered on previous pregnancies showed that the majority of respondents (94.2%) had been pregnant before, while only 5.8% responded that this was their first pregnancy. Respondents were also asked about the gestational age of their current pregnancy and found that, among the total respondents, 16.2% of them were in the 1–3 month range of gestation, 29.2% were in the 4–5 month range, and 54.6% of them were 6 months and above. Almost all respondents (98.0%) attended ANC during their current pregnancy, while only 2.0% did not. Among those who attended ANC, the frequency of the visit varies accordingly. 5.1% went once for ANC, 12.9% went twice, 20.0% went three times, 20.8% went four times, 15.3% went five times, and 25.9% of them went more than six times. According to respondents, ITNs were perceived as highly effective in preventing malaria, with 96.8% reporting that ITNs prevented malaria, while only 3.2% disagreed (Table 25).

Table 25: Respondent Characteristics and Utilization of ITN Among Pregnant Women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, 2024.

Variables	Response categories	Count respondents (N)	Percentage (N %)
Presence of pregnancy before	Yes	471	94.2
	No	29	5.8
Gestational age of current pregnancy	1 to 3 months	81	16.2
	4 to 5 months	146	29.2
	6 and above	273	54.6
Attendance of ANC during this pregnancy	Yes	490	98.0
	No	10	2.0
Frequency of ANC visit	Ones	25	5.1
	Two times	63	12.9
	Three times	98	20.0
	Four times	102	20.8
	Five times	75	15.3
	More than 6 times	127	25.9
Effectiveness of ITN	Yes	471	94.2
	No	29	5.8

Environmental, ITN, and Other Factors in the Home

As indicated in Table 26 below, a significant portion of respondents (64.0%) reported the presence of mosquito breeding sites around their homes, while the remaining 36% indicated that there were no such sites nearby. Regarding the method used to prevent malaria transmission, among respondents, the most common methods cited for preventing malaria transmission were using ITNs (50.8%) and drug prophylaxis (26.8%). Some respondents also mentioned the combined use of ITNs and other methods like DDT spraying or drug prophylaxis. Looking at the presence of ITN binding, hanging, and ownership of ITNs, the majority of households (98.4%) had ITN binding or hanging areas, with hanging areas for ITNs reported in almost all households. Additionally, households typically owned multiple ITNs, with 56.2% having three or more, 25.8% having two ITNs, and 18% owning only one ITN.

Respondents were asked about their perceptions regarding which household members should be prioritized for malaria prevention measures. Accordingly, respondents believed that pregnant women should be given the highest priority in malaria prevention within households (63.8%),

followed by adults (23.0%), under-five children (12.6%), and a very small percentage mentioned old age (0.6%). Similarly, respondents were also asked about their perception of whether using ITN causes a problem or not, and about 24% of respondents reported yes, while the remaining said don't. Among the respondents who reported yes, common issues raised were heat (36.4%) and lack of comfort (40.7%). However, a smaller percentage (22.9%) reported issues related to air protection while sleeping.

Table 26: Environmental, ITN, and other factors for pregnant women in Hulbareg Woreda, Central Region, Ethiopia, 2024.

Variables	**Response category**	**Count of response (N)**	**Percent (N %)**
Presence of Mosquito Breeding Sites Around the House	Yes	320	64.0
	No	180	36.0
Methods to prevent malaria transmission	By using ITN	254	50.8
	By DDT spraying	1	0.2
	Drug prophylaxis	134	26.8
	By using ITN and By DDT spraying	16	3.2
	By using ITN and Drug prophylaxis	63	12.6
	By DDT spraying and Drug prophylaxis	29	5.8
	By using ITN, Drug prophylaxis and Drug prophylaxis	3	0.6
Number of ITNs owned by households	One	90	18.0
	Two	129	25.8
	Three and above	281	56.2
Presence of binding/hanging area of ITN	Yes	492	98.4
	No	8	1.6
Household members given priority in malaria prevention	Pregnant women	319	63.8
	Adults	115	23.0
	Old age	3	0.6
	Under five children	63	12.6
Causes of using ITN	Protects air	27	22.9
	Causes heat	43	36.4
	Causes discomfort	48	40.7

Bivariate Analysis of Factors Associated with ITN Utilization

In the bivariate analysis results presented in Table 28 below, among the study variables, maternal age (COR=2.25), maternal education (COR=0.31), family size (COR=1.97), gestational age of the pregnancy (COR=0.29), experiencing malaria attack during the current pregnancy (COR=0.38), awareness of malaria symptoms (COR=3.64), presence of mosquito breeding sites around the house (COR=2.51), and perception of getting problems when using ITN (COR=0.35) were factors found to have a statistically significant association with the ITN utilization of pregnant women at a p-value < 0.05.

Table 27: Bivariate logistic regression analysis of factors associated with ITN utilization among pregnant women in Hulbareg Woreda, Central Ethiopia Region, Ethiopia, 2024.

Variables (Factors)	Response categories	P. Value	COR	95% C.I.	
				Lower	Upper
Age category of the respondent	18 to 25	0.000			
	26 to 35	0.392	1.230	0.765	1.978
	36 to 45	0.000	4.926	2.727	8.898
Education status of the respondent	No education	0.000			
	Primary	0.000	0.207	0.140	0.307
	High school	0.003	0.300	0.137	0.658
	Above 12	1.000	0.000	0.000	
Family size of the HH	Less than 3	0.000			
	4 to 6	0.165	0.736	0.478	1.134
	Greater than 6	0.000	5.385	2.871	10.099
Gestational age of current pregnancy	1 to 5 months	0.000			
	6 to 10 months	0.000	0.112	0.052	0.241
Experience malaria attack	Yes (Ref)	0.000			
	No	0.042	0.384	0.152	0.968
Aware of symptom of malaria	Yes (Ref)	0.000			
	No	0.001	3.648	1.654	8.042
Presence of Mosquito Breeding Sites Around the House	Yes (Ref)	0.000			
	No	0.000	2.519	1.733	3.663
Perceived problems using ITN	Yes (Ref)	0.000			
	No	0.000	0.359	0.234	0.550

Multiple Logistic Regression Analysis of Factors Associated with ITN Utilization

Variables identified as statistically significant factors for ITN utilization in the bivariate analysis were included in the multiple logistic regression analysis to assess their significance while controlling for other variables. The results of the multiple logistic regression analysis, presented in Table 28 below, indicate that the presence of mosquito breeding sites around the house, family size, educational status, and gestational age of the pregnancy was found to have a statistically significant association with ITN utilization among pregnant women.

Moreover, the results indicated that pregnant women who reported the presence of mosquito breeding sites around their homes were 1.7 times more likely to use ITNs compared to those who reported no breeding sites. Additionally, families with 4 to 6 members had a 68% higher likelihood of using ITNs than those with fewer than 4 members.

Pregnant women who attended primary education and high school had a 72% and 81% lower likelihood of using ITNs, respectively, compared to those who never attended school. Additionally, pregnant women who do not perceive any problems associated with using ITNs were 3.5 times more likely to use them than those who believe that using ITNs causes issues. Conversely, pregnant women in the 6- to 10-month gestation period had an 85% lower likelihood of using ITNs compared to those in the 1 to 6-month gestation period.

Table 28: Multiple Logistic Regression Analysis of Factors Associated with ITN Utilization Among Pregnant Women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, 2024.

Variables	Response categories	Sig.	AOR	95% C.I	
				Lower	Upper
Presence of Mosquito Breeding Site Around the House	No (Ref)				
	Yes	0.018	1.787	1.105	2.890
Family size of the HH	Less than 4	0.000	1		
	4 to 6	0.082	0.588	0.323	1.069
	Greater than 6	0.000	7.284	3.247	16.338
Education status of the respondent	No education	0.000	1		
	Primary	0.000	0.280	0.169	0.466
	High school	0.001	0.195	0.071	0.529
	Above 12	1.000	0.000	0.000	
Does sleeping under a bed net cause any problems?	No	0.000	3.538	2.034	6.156
	Yes (Ref)	0.000	0.283	0.162	0.492
Gestational age of current pregnancy	1 to 5 months	0.000	1		
	6 to last months	0.000	0.146	0.089	0.240
	Constant	0.000	11.637		

Qualitative part results

Socio-Demographic Characteristics of the Participants

A total of twelve individuals participated in the focus group discussions (FGDs). Every participant in the focus group discussions was of Silte ethnicity. The pregnant mothers were all from rural areas. The ages of the participants varied from 20 to 32 years old. Eight of the individuals had never attended formal schooling, and four had only completed sixth grade. All the study participants were Muslims.

The qualitative data were organized into two main themes: the utilization status of insecticide-treated nets (ITNs) among pregnant mothers and the factors influencing ITN use by pregnant mothers.

Utilization status

A 25-year-old woman stated, "We mostly use the nets when malaria starts and during the rainy season when mosquitoes return. We don’t use the nets in winter because we don't see mosquitoes in the house" (ID-002).

A 27-year-old woman who was not using insecticide-treated nets mentioned that they irritated her. She also noted that some people use ITNs for purposes other than their intended used as ropes (ID-009).

A 26-year-old pregnant mother emphasized the importance of preventing malaria transmission by properly using insecticide-treated nets, draining stagnant water, and maintaining environmental sanitation (ID-001).

Additionally, a 25-year-old woman suggested that malaria control can be achieved by spraying insecticides and ensuring windows are properly screened (ID-001).

Factors associated with ITN use.

A 30-year-old pregnant woman said that I do not use insecticide-treated nets every day because they cause heat and air hangers (ID-005).

The 29-year-old pregnant woman mentioned that various factors impact the daily use of insecticide-treated nets, such as their irritability, quick dirt accumulation, inability to effectively kill mosquitoes, and tendency to generate heat (ID-008).

A 23-year-old pregnant woman suggested improving the utilization of insecticide-treated nets by raising awareness about the proper way to hang and use them, conducting regular house-to-house follow-ups by health extension workers, empowering the health development army, and implementing a one-on-five discussion approach. She also proposed that individuals who misuse ITNs for other purposes should face penalties imposed by community organizations, such as elders and the community (ID-011).

DISCUSSION

This research revealed that the rate of insecticide-treated net (ITN) utilization among pregnant women in Hulbareg Woreda was 56%. This finding is largely consistent with studies conducted in Gambella (51.4%) (22), Northwest Ethiopia (56.5%) (23), Damot District (63.1%) (24), and as well a review of meta-analyses made of similar research topics in parts of Ethiopia and reviews in sub-Saharan Africa (58.3%) (25), and Rwanda (57.9%) (26). It also indicates a higher rate of ITN utilization compared to the findings of studies conducted in Shoshogo District (15.8%) (27), Benishangul (23.1%) (28), Adama (43.1%) (29), and Gida Ayana (37.1%) (30). On the other hand, this finding reflects a lower rate of ITN utilization compared to the study conducted in the Alamata District of the Tigray Region (69%) (10). This variability may be attributed to

differences in residence areas, sociodemographic characteristics, beliefs, and other cultural factors among the participating localities.

This utilization rate is relatively lower than what was observed in studies conducted in other malaria-endemic countries, such as the Democratic Republic of Congo (71.4%) (31) and Mozambique (68.4%) (32). However, it is also higher than rates reported in countries, like Malawi (53%) (33) and Uganda (35%) (34). A logical explanation of these differences could be that various countries experience different levels of malaria risk due to variations in climate and geography, which in turn influence their malaria control strategies.

Furthermore, the findings indicated that the presence of mosquito breeding sites around the house increases the likelihood of ITN utilization by 1.78 times compared to those without such breeding sites. This may be explained by the notion that individuals exposed to mosquito breeding sites feel less concern about mosquito bites, leading to reduced utilization of ITNs. Families with 4 to 6 members had a 42% lower likelihood of using ITNs compared to households with fewer than 4 members, while households with more than 6 members exhibited a 72% lower likelihood of ITN utilization. This may be attributed to the challenges that arise in households with larger family sizes, making it difficult to prioritize and focus on the needs of pregnant women. This result is comparable with a similar study conducted in Jimma Zone, Limmu Seka District (35), as well as in Oromia Region, Mieso woreda (36). On the other hand, pregnant women who don't perceive that using ITN causes a problem had 3.5 times more likelihood of using ITN than those who say that using ITN causes a problem. This finding is also consistent with a similar study carried out in the Oromia Region, Mieso woreda (36). This is related to the knowledge of the pregnant women, who assums the side effects rather than the use of ITN. Pregnant women who attended primary education and high school were 1.28 times and 2.19 times more likely to use ITNs, respectively, compared to those who never received education. This result is nearly consistent a similar systematic review conducted in Jimma Zone, Limmu Seka District (35). and also, in Oromia Region, Mieso woreda (36) and a nationwide study conducted in Rwanda (26).

The other important finding from this research, which is slightly different from the initial assumption and many other studies, is that pregnant women who were in the 6-to-10-months

gestation period had 85% less likelihood of using ITN than those who were in the 1 to 6 month gestation period. The reason behind this could be explained by the fact that during the beginning of gestation, women's attention is given to their health condition as exposure to the failure of the pregnancy is higher, and also because they experience the pregnancy more times, they lose fear and are reluctant to care.

Participants indicated that numerous issues impact the daily usage of insecticide-treated nets, such as their irritation, rapid dirt accumulation, failure to properly kill mosquitos, and inclination to generate heat, which is similar to the studies carried out in the Belesa area (23). Another participant noted that some individuals use insecticide-treated nets for purposes other than their intended use, such as for pressing grain or as ropes. FGD participants suggested enhancing the use of insecticide-treated nets by raising awareness on the proper ways to hang and use them, conducting regular house-to-house follow-ups by health extension workers, empowering the health development army, and implementing a one-to-five discussion approach. They also advocated that people who use insecticide-treated nets for other reasons suffer fines imposed by communal bodies like elders and the community.

Strength and limitation of study

Strength

- Incorporating a qualitative study enables the exploration of new ideas expressed by participants.
- The qualitative component provides rich insights into the utilization of insecticide-treated nets among pregnant women and enhances the understanding of the factors influencing ITN usage during pregnancy.

Limitation

The study design (cross-sectional study design) is viewed as a drawback since it does not reveal the duration of exposure as well as other effects.

Conclusion and Recommendation

Conclusion

A significant proportion of the pregnant women participating in this study, nearly 50%, did not make use of insecticide-treated nets (ITNs). This figure falls short of the utilization target established by the Ministry of Health for at-risk populations. Living near mosquito breeding sites, educational status, perceptions of problems associated with using ITNs, and gestational age were factors significantly associated with ITN utilization.

Recommendation

- A more robust awareness-creation system should be implemented before and after the distribution of insecticide-treated nets.
- After the distribution of nets, the Woreda health sector should carry out follow-ups to ensure that the nets are not being used for unintended purposes.
- The Woreda should focus on strengthening the women's health development army and their one-to-five networks, while also engaging community leaders to encourage proper utilization of the nets among women in the area.
- The Ethiopian government should prioritize educating pregnant mothers and utilize multimedia strategies to raise awareness about the use of insecticide-treated nets (ITNs).

References

1. World malaria report 2022 World malaria report 2022. 2022.

2. Schantz-Dunn J, Nour NM. Malaria and pregnancy: a global health perspective. Rev Obstet Gynecol [Internet]. 2009;2(3):186–92. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19826576%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2760896

3. NMCP; Ministry of Health and Sports. National strategic plan: Intensifying malaria control and accelerating progress towards malaria elimination (2016-2020). 2016;57. Available from: http://origin.searo.who.int/myanmar/documents/malarianationalstrategicplan2016-2020.pdf

4. Diema Konlan K, Amu H, Konlan KD, Japiong M. Awareness and Malaria Prevention Practices in a Rural Community in the Ho Municipality, Ghana. Pani SP, editor. Interdiscip Perspect Infect Dis [Internet]. 2019;2019:9365823. Available from: https://doi.org/10.1155/2019/9365823

5. Konlan KD, Japiong M, Konlan KD, Afaya A, Salia SM, Kombat JM. Utilization of Insecticide Treated Bed Nets (ITNs) among Caregivers of Children under Five Years in the Ho Municipality. Interdiscip Perspect Infect Dis. 2019;2019.

6. Mbchb IP, Mbbs Mph I V, Mbbs EO, Mph M, Bm A, Msc M. The effect of insecticide treated bed net use on malaria episodes, parasitaemia and haemoglobin concentration among primigravidae in a peri-urban settlement in southeast Nigeria. J Rural Trop Public Heal. 2007;6:24–32.

7. WHO. Word Malaria Report 2021 [Internet]. Word Malaria report Geneva: World Health Organization. (2021). Licence: CC BY-NC-SA 3.0 IGO. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

8. Bhatt S, Weiss DJ, Cameron E, Bisanzio D, Mappin B, Dalrymple U. Europe PMC Funders Group The effect of malaria control on Plasmodium falciparum in Africa between 2000 and 2015. 2016;526(7572):207–11.

9. Gamble C, Ekwaru PJ, Garner P, Ter Kuil FO. Insecticide-treated nets for the prevention of malaria in pregnancy: A systematic review of randomised controlled trials. PLoS Med. 2007;4(3):506–15.

10. Desta Araya G. Utilization of Long Lasting Insecticidal Nets Among Household in Malarious Areas of Raya Alamata District, Tigray, Ethiopia. Sci J Public Heal. 2015;3(2):216.

11. Tariku MK, Dagnew Z, Misikir SW, Belete AH. Utilization of Long-Lasting Insecticide Treated Net and Associated Factors Among Pregnant Women in Malarious Kebeles in Awabel District, North-West Ethiopia, 2017 [Internet]. Research Square; 2020. Available from: http://europepmc.org/abstract/PPR/PPR159712

12. Angesom T, Gebreyesus H, Gebremariam B. Long-Lasting Insecticidal Net Utilization and Associated Factors Among Pregnant Women in Asgede Tsimbla District, Northern Ethiopia, 2017. Environ Health Insights. 2020;14.

13. Shonga AA, Boltena MT, Boltana TF, Sciences H. Insecticide Treated Bed Nets Utilization among Pregnant Mothers and Associated Factors in Damot Pulasa District , Southern. J Heal Med Nurs [Internet]. 2018;46:224–30. Available from: https://pdfs.semanticscholar.org/a957/2480c25d693b39f7a7e3e9e703c6a88827fb.pdf

14. Admasie A, Zemba A, Paulos W. Insecticide-Treated Nets Utilization and Associated Factors among under-5 Years Old Children in Mirab-Abaya District, Gamo-Gofa Zone, Ethiopia. 2018;6(February):1–7.

15. Yeshaneh A, Adane D. Insecticide Treated Net (ITN) Utilization and Associated Factors among Pregnant Women's in Halaba Kulito Town, South Ethiopia, 2016: Cross-Sectional Study. Int J Infect Dis Ther. 2020;5(2):34.

16. 2016 EFY population Profile (Hulbareg).

17. Hulbareg Woreda Health Office Malaria 2022 Report.

18. State OR. FUCULTY OF MEDICINE Assessment of Insecticide Treated Nets (ITNs) Utilization among Children under five years of age and Pregnant women of Adama Woreda , By Advisor : Dr . Abera Kumie (MD , MSc) Thesis submitted to the School of Graduate Studies of Ad. 2007;(January).

19. Astatkie A, Feleke A. Utilization of insecticide treated nets in Arbaminch Town and the malarious villages of Arbaminch Zuria District, southern Ethiopia. Ethiop J Heal Dev. 2010;24(1):15–24.

20. Atieli HE, Zhou G, Afrane Y, Lee MC, Mwanzo I, Githeko AK, et al. Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. Parasites and Vectors [Internet]. 2011;4(1):113. Available from: http://www.parasitesandvectors.com/content/4/1/113

21. Lencha B, Deressa W. Insecticide treated net utilization and its barriers among under-five children in Adami Tulu district, Oromia Regional State, Ethiopia: A qualitative study. Glob J Med Res. 2015;15(5):0–6.

22. Eshetu B, Bekele H, Debella A, Eyeberu A, Balis B, Habte S, et al. Insecticide-treated net utilization and associated factors among pregnant women in Ethiopia: a systematic review and meta-analysis. Front Glob Women's Heal [Internet]. 2023;4(November):1–12. Available from: https://doi.org/10.3389/fgwh.2023.1147583

23. Yirsaw AN, Gebremariam RB, Getnet WA, Mihret MS. Insecticide-treated net utilization and associated factors among pregnant women and under-five children in East Belessa District, Northwest Ethiopia: using the Health Belief model. Malar J. 2021;20(1).

24. Angesom T, Gebreyesus H, Gebremariam B. Long-Lasting Insecticidal Net Utilization and Associated Factors Among Pregnant Women in Asgede Tsimbla. 2020;

25. Ameyaw EK. Individual, community and societal correlates of insecticide treated net use among pregnant women in sub-Saharan Africa: a multi-level analysis. BMC Public Health. 2021;21(1):1–13.

26. Kawuki J, Donkor E, Gatasi G, Nuwabaine L. Mosquito bed net use and associated factors among pregnant women in Rwanda : a nationwide survey. 2023;9:1–10.

27. Fuge TG, Ayanto SY, Gurmamo FL. Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashogo District, Southern Ethiopia. Malar J [Internet]. 2015;14(1):1–9. Available from: http://dx.doi.org/10.1186/s12936-015-0755-7

28. OUTBNUCAZ_0.pdf.

29. Nesga D, Abate D, Birhanu G, Addissie A. Assessment of Malaria Vector Control Measures (ITNs & IRS) Utilization and Factors Affecting it in Adama District, East Shoa Zone, Oromia Region Ethiopia, 2018. J Fam Med Heal Care. 2020;6(2):46.

30. Tadele G, Samuel A, Adeba E. Replacement of Long Lasting Insecticide Treated Nets in Malarious Kebeles of Gida Ayana District, East Wollega Zone, Ethiopia. Sci Technol Arts Res J. 2014;3(2):162.

31. Inungu JN, Ankiba N, Minelli M, Mumford V, Bolekela D, Mukoso B, et al. Use of insecticide-treated mosquito net among pregnant women and guardians of children under five in the democratic republic of the Congo. Malar Res Treat. 2017;2017.

32. Moon TD, Hayes CB, Blevins M, Lopez ML, Green AF, González-Calvo L, et al. Factors associated with the use of mosquito bed nets: Results from two cross-sectional household surveys in Zambézia Province, Mozambique. Malar J. 2016;15(1):1–10.

33. Mwandama D, Gutman J, Wolkon A, Luka M, Jafali J, Ali D, et al. The use of intermittent preventive treatment in pregnancy and insecticide-treated bed nets for malaria prevention by women of child-bearing age in eight districts in Malawi. Malar J. 2015;14(1):1–10.

34. Obol JH, Ononge S, Orach CG. Utilisation of insecticide treated nets among pregnant women in Gulu: A post conflict district in northern Uganda. Afr Health Sci. 2013;13(4):962–9.

35. Hambisa MT, Debela T, Dessie Y, Gobena T. Long lasting insecticidal net use and its associated factors in Limmu Seka District, South West Ethiopia. BMC Public Health. 2018;18(1):1–7.

36. Tesfaye T, Alemu BM, Egata G, Bekele H, Merga BT, Eshetu B, et al. Insecticide-Treated Nets Utilization and Associated Factors Among Pregnant Women in Miesso Woreda, Eastern Ethiopia: Observational Study. Int J Womens Health. 2022;14.

Chapter VI: Abstract for Scientific Presentation.

6.1. Health profile description of Hulbareg Woreda Silte Zone, Southern Nations Nationalities Peoples Region, Ethiopia, January 2023.

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Abstract

Background: The health profile is essential for prioritizing health-related community issues, planning interventions, and conducting operational research. It assesses health problems in Woreda, communicates disease burdens, and informs possible interventions for local stakeholders.

Objective: To describe health and health-related issues like health status and health indicators, identify problems for priority setting, and design an action plan for identified health problems in Hulbareg woreda in 2022.

Methods: A cross-sectional study was conducted on the health profile of various public sectors in the Woreda, using a standard checklist and analyzing data using Microsoft Excel and GIS.

Results: Wereda has 12 health posts, four health centers, and six private health institutions providing healthcare services. Coverage rates are high for ANC, PNC, delivery, contraceptives, Penta 3, and measles. Pneumonia is the leading disease, followed by typhoid and upper respiratory tract infections. Malaria cases increased by 5% in 2022.

Conclusion and Recommendation

The main health issue is pneumonia. Malaria cases increased by 5%, and HIV testing and screening are low. Strengthening control measures, HIV counseling, and strict DOT are crucial.

6.2. A Five-years retrospective malaria surveillance data analysis in Silte Zone, Southern Nations Nationalities People's Region, Ethiopia, March 2023.

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Address: [1]Addis Ababa University College of Health Science School of Public health fourteen cohort EFETP Resident. [2]Addis Ababa University, College of health Science, School of Public health, Department of Epidemiology and Biostatistics, Addis Ababa, Ethiopia. [3]Ethiopian Public Health Institute.

Abstract

Background: Malaria, a disease caused by the Plasmodium parasite, represents a major public health challenge in Ethiopia, contributing to elevated mortality rates and widespread poverty. The analysis of surveillance data from the Silte Zone seeks to evaluate disease trends and the effectiveness of control measures, thereby assessing the impact of various control programs.

Objective: To describe malaria cases, deaths, positivity rate by species, and its trends by person, time, and place in Silte Zone, Southern Nation Nationalities Peoples Region, Ethiopia.

Methods: A five-year retrospective review of malaria surveillance data from 2018–2022 was conducted using Microsoft Excel 2010 and Arc GIS, presenting results through tables, figures, and map.

Results: Between 2018–2019 and 2021–2022, there were 36041 confirmed cases of malaria, with a test positivity rate of 36.12%. Plasmodium falciparum made up 64.3% and Viviax 35.6%. The mean annual prevalence rate was 10.14 per 1000 at-risk populations per year. The rate of deaths was 0.01% and clinical cases 1.58% in 2021/2022. Regarding the age groups, 38.2% were under five, 24.9% were 5–14, and 36.8% were 15 years old.

Conclusion and recommendation: The study highlights malaria as a public health concern, with P. falciparum being the predominant species. Despite occasional peaks trends in confirmed cases, clinical cases, hospitalizations, and deaths have reached near zero. The Woreda Health Office should strengthen control and prevention interventions.

Chapter VII: Narrative Summary of Disaster Situation

7. Narrative Report of Flood Disaster Situation in East Silti of Silte Zone, Central Ethiopia Region, Ethiopia August, 2024.

Abstract

Background: A disaster is an occurrence or set of events resulting in casualties and damage or loss of property, infrastructure, the environment, essential services, or means of subsistence on a scale that exceeds the affected community's normal capacity to cope. Disaster may also be referred to as a catastrophic situation in which the normal pattern of life or ecosystem has been disrupted and extraordinary emergency interventions are required to save and preserve lives and/or the environment.

Methods: Semi-structured interviews were conducted from August 15 to 28, 2024, to gather information from the district health office, assess anticipated risks, review papers and reports, and discuss with the district readiness and response task force.

Results: Heavy rains produced flash floods in the Misrak Silti area, displacing 6,000 people and drowning 32 houses. The population at danger was 54% female, with no deaths and only property losses.

Conclusion: Flooding forced kebeles to migrate and lose everything they had, including daily consumption. As a result, the evacuated people had food and water shortages. Central Ethiopia Regional Health Bureau should help displaced communities to overcome the flood risk.

Keywords: Disasters. Flooding, Misrak Silti Woreda, Central Ethiopia Region, Ethiopia, 2024.

1. Introduction

1.1. Background

A disaster is a severe disruption causing significant losses, while a hazard is a potentially damaging event causing loss of life, property damage, social and economic disruption, or environmental degradation (1). Floods are the most damaging natural disasters in the world, killing the most people and causing the greatest property damage (2). Every year, floods harm around 85 million people globally. Flooding was the most deadliest natural disaster between 2012 and 2014, accounting for 42% of the approximately 40,000 deaths (3).

Floods and droughts are a major threat to Africa, particularly Ethiopia, accounting for over 80% of disaster-related deaths and 70% of economic losses in Sub-Saharan Africa (4).

Ethiopia experienced floods in 2020, affecting 1,017,854 people and displacing 292,863 during the 2013-2012 summer season, resulting in animal loss, agricultural devastation, and severe housing and infrastructure damage (5).

Ethiopia received significant rainfall from June to September 2020, resulting in flooding in six out of ten areas, with the Oromia region being the most hit, affecting 447,565 people (5).

Floods can have a direct influence on health, such as death and physical injuries, as well as indirect ones including infections, malnutrition, and the exacerbation of noncommunicable diseases (3). The assessment outlines the health risks and health-related issues in Misrak Silti Woreda, Silte Zone, Central Ethiopia, due to flooding from the Marako Irrigation Canal.

2. Objective

2.1. General objective

To assess disasters and address anticipated risks to formulate a response plan for Misrak Silti Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, in 2024.

2.2. Specific objectives

- To assess the potential dangers in Misrak Silti Woreda's healthcare delivery system.
- To intervene for displaced populations based on risk assessment.
- To develop a flood response plan based on assessment findings.

3. Method, Area, and Period

Misrak Silti Woreda is situated in Central Ethiopia, approximately 28 kilometers from the zonal town of Worabe and 148 kilometers from Addis Ababa, the capital. The woreda is bordered by Lanfro and Dalocha to the south, Wulbareg to the southwest, Alicho Werero to the west, the Gurage Zone to the north, and Oromia to the east. Covering an area of about 133 hectares, the topography ranges from 2,060 to 2,100 meters above sea level.

The climate of Misrak Silti is characterized as midland agro-climatic, classified as "Kola and Woina-dega." The average minimum and maximum annual temperatures are 15°C and 25°C, respectively. The mean annual rainfall in the district ranges from 700 to 800 mm, which supports agricultural activities.

The woreda consists of 16 rural kebeles and 2 urban kebeles. The population is estimated at 117,784, comprising 57,510 males and 60,274 females (Central Statistical Agency, 2022). The primary economic activities include the cultivation of various cereals, such as teff, beans, and maize. Additionally, livestock rearing is common, serving both as a source of food and cash.

4. Results

4.1. Current Flood Disaster Situations Misrak Silti Woreda

In 2024, heavy rainfall in Misrak Silti Woreda resulted in flash floods, displacing residents from four kebeles. This situation has significantly heightened the risk of a choleral outbreak due to contaminated water sources and deteriorating sanitary conditions. Additionally, the flooding creates favorable conditions for mosquito breeding, increasing the risk of malaria and other vector-borne diseases.

4.2. Displacement and risk occurred

At Misrak Silti Woreda, Silte Zone, Central Ethiopia Region, there were 3,312 displaced individuals, comprising 972 households in four displacement kebeles that were identified. The total population displaced was 1712 (52%), and the rest were males. Due to this disaster, there were no households that were damaged, and no deaths occurred in the district except for displacement and severe loss of property. According to a rapid assessment made by the district and deployed by the regional health bureau, 1,457 people were placed in school and the rest with host communities that were not affected by flooding in the district.

Table 29: Flood Affected population and Kebeles Silti Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, 2024.

Affected kebele	Kebele total population	Number of House hold	Affected HH	Affected population
Sada gora	429	88	64	429
Mirab yekoch	1772	361	267	1772
Misrak yekoch	1011	206	197	1011
Balo kereso	1555	317	232	105
Total	4,767	972	760	3312

4.3. The immediate public health risk assessed

4.4. Access to health services for displaced communities

The flood disrupted the provision of fundamental health services, necessitating the establishment of temporary mobile clinics to maintain the continuity of these essential health services. The mobile health service provides health education, conducts screenings and treatments for chronic diseases, assesses malnutrition, and administers routine vaccinations for children.

4.5. Diseases linked to overcrowding

The populations residing in the flood-affected regions have been relocated to schools and integrated with the host community. This situation has heightened the risk of various communicable diseases; including measles, meningitis, and the development of tuberculosis, thereby further increasing the infection rate.

4.6. Water and food-borne illnesses

Flooding causes clean water scarcity due to broken or contaminated water schemes, low access to safe water, insufficient hygiene, and contaminated environments for food preparation. This leads to health problems, increased risk of water-borne diseases like Cholera, typhoid, and Shigellosis, and unsafe drinking and food use.

4.7. Vector-borne illness

Malaria is prevalent in all Kebeles of the district that have been affected by flooding. Inadequate management of water supply and storage, along with unsafe utilization practices, may contribute to an increase in vector breeding in this region. This situation further heightens the risk of malaria exposure.

4.8. Malnutrition

Flooding disrupted a therapeutic feeding program in the district, potentially exposing children and pregnant mothers to malnutrition diseases due to compromised immunity (see Table 30).

Table 30: Malnutrition cases by year and months in East Silti, Silite Zone, Central Ethiopia Region, Ethiopia, 2024.

Months	2022		2023		2024	
	Number of SC	Number of OTP	Number of SC	Number of OTP	Number of OTP	Number of SC
June	8	15	2	6	9	3
July	5	7	2	3	13	2
August	3	5	3	2	4	1
Total	**16**	**27**	**9**	**11**	**26**	**6**

4.9. Interventions Taken by the District Task force committee.

4.10. Provision of health services for displaced community

- Set up a mobile clinic in the temporary residence area.
- Screening for malnutrition.
- Guarantee the availability of essential and comprehensive emergency medical services, along with a fundamental service package for reproductive health.
- Enhance the availability of essential medications for therapeutic purposes.
- Recognize and respond to the essential health requirements of at-risk populations, including the elderly and individuals with disabilities.

4.11. Risk reduction due to overcrowding

Enhance the surveillance and response systems for communicable diseases within both the school-sheltered displaced community and the host community where the displaced individuals reside temporarily.

4.12. Water, Food and Vector borne diseases

To mitigate the risks of water and food shortages, as well as the transmission of vector-borne diseases among school occupants and the local community, it is crucial to identify appropriate household water treatment methods that are specific to each community, considering the

availability of water purification chemicals. Temporary latrines have been constructed, and essential hygiene messages have been disseminated through the distribution of Information Education Communication (IEC) materials. Additionally, displaced communities have been provided with training on how to identify the signs, symptoms, and risk factors related to malaria, safe water storage techniques, the application of water treatment methods, and the use of long-lasting insecticidal nets (LLINs).

Table 31: Plan of Action for Flood intervention by Key Thematic Areas of Intervention in Misrak Siliti Woreda, Silte Zone, Central Ethiopia Region, Ethiopia, August 2024.

Key thematic areas of intervention	Activities to be done	Responsibly body	Indicators
✚ Social mobilization and awareness creation	✚ Mobilizing school-sheltered communities through health education and risk communication strategies for malaria disease control and prevention. ✚ Distribute leaflets and posters to displaced communities outlining malaria, cholera, and other epidemic disease transmission and prevention strategies.	Misrak Silti Woreda Health office, Woreda communication office,, Woreda Administration, Kebeles leaders,	Health education, and awareness creation sessions conducted Distributed leaflets and posters
✚ Water, Hygiene, and Sanitation	✚ Provision of water for flood-affected kebeles in place where there is no supply of clean water ✚ Supplies and distributes water treatment chemicals (Bishan Gari, and Aqua Tab) ✚ Make available various water storage items, such as jerry cans. ✚ Check the water quality. ✚ Evaluate the availability and use of latrines in each temporary shelter and community that houses the displaced population. ✚ Construct appropriate latrines and showers at the temporary shelter. ✚ Follow upthe use of latrines. ✚ Drainage of blocked flood waters ✚ Rebuild public latrines damaged by the flood.	Central Ethiopia Regional Health Bureau PHEM directorates in collaboration with Water, and Energy Bureau Woreda Health and Water Office Kebeles leaders, community representatives	➢ Kebeles reassessed for risk identification/mapping ➢ Water treatment chemicals supplied, ➢ Face masks, and sanitizers distributed ➢ Water treatment chemicals were provided, along with the distribution of face masks and sanitizers. ➢ The quantity of water storage materials made available or distributed. ➢ The total number of laundry and hand soaps distributed. ➢ Water quality testing was performed.

	➢ Inspection of food and drink at the school shelter		➢ The number of suitable pit latrines constructed and in use. ➢ The total count of latrines. ➢ The number of latrines and showers built at temporary shelters. ➢ Recorded the volume of floodwater that was drained. ➢ Inspections were carried out to ensure the safety of food and water.
Surveillance, malnutrition, malaria, TB, meningitis, measles, and other communicable disease prevention and control	➢ Assign community members to notify or inform on new occurrences or rumors in temporary shelters. ➢ Maintain daily active case searches, including rumor documentation and verification at host community and school shelter locations. ➢ Conduct a proper investigation into any rumors obtained from the host community or temporary shelters. ➢ Regular surveillance data collection, analysis, and reporting to higher levels ➢ Ensure the availability and use of LLINs. ➢ Environmental management to drain stagnated water ➢ Routine screening for malnutrition in children under five years of age, pregnant women, and breastfeeding mothers, along with referrals to Outpatient Therapeutic Program (OTP) or Targeted Supplementary Feeding (TSF) services as necessary.	Central Ethiopia Region Health Beru PHEM directorates , Woreda Health Office Kebeles leaders, HEWs, community representatives Assigned rapid response teams	➢ Documented and verified rumors regarding diseases ➢ Total outbreaks that have been investigated, confirmed, and reported ➢ Quantity of surveillance data that has been collected, analyzed, and reported ➢ Accessibility and usage of long-lasting insecticidal nets (LLINs) ➢ Count of mosquito breeding sites that have been disregarded

Case management	- Providing emergency medications and medical supplies for school-sheltered and host communities. - In temporary clinics, assign health professionals to diagnose and treat patients appropriately. - Obtain case management guidelines and definitions. - Set up a referral mechanism for complex patients to nearby health clinics or hospitals. - Ensure that temporary clinics have infection prevention materials and protocols. - A supplementary feeding program for children under the age of five, as well as pregnant and breastfeeding mothers, is available at adjacent health institutions. - Ensure routine MCH service utilization	Central Ethiopia Region Health Beru, ZHD, Woreda Health Office, HC, Hospital	➢ Availability of emergency medications and medical supplies ➢ Availability of healthcare professionals at the designated temporary clinic ➢ Use of a planned referral procedure for difficult cases. ➢ Distributed infection prevention supplies. ➢ Children were assessed for Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM). ➢ The mother, who is either pregnant or breastfeeding, provided additional nutritional support.
Coordination	- Strengthen the task force committee. - In strength Task Force and technical team - Schedule regular meetings with the TF and technical teams. - Develop and implement an emergency response plan.	Central Ethiopia Region Health Beru PHEM directorates Woreda Administration and Kebele leaders	Conducted a review meeting and created and distributed EPRP for the district.

References

1. UNDP. United Nations Development Programme Ethiopia 2013 Annual Report Disaster Risk Management and Livelihoods Recovery Programme. 2013;1–22.

2. Brown I, Chikagbum W. PLANNING RESPONSE TO WATERRELATED DISASTERS IN NIGERIA: THE RIVERS STATE EXPERIENCE. Int J Sci Eng Res. 2015 Jun 25;Volume 6:32–44.

3. Älgå A, Dang TAT, Saulnier DD, Nguyen GT, von Schreeb J. Hope for the best, prepare for the worst—An assessment of flood preparedness at primary health care facilities in central Vietnam. Int J Environ Res Public Health. 2018;15(12).

4. Haile Erena S, Worku H. Urban flood vulnerability assessments: the case of Dire Dawa city, Ethiopia. Nat Hazards. 2019 Jun 1;97.

5. Joint Government and Humanitarial Partners. Joint Government – Humanitarian Partners National Flood Contingency Plan 2020 kiremt Season. 2020;2020(June):0–28.

Chapter VIII: Research Thesis Report

8. Assessment of Utilization of Insecticide Treated Bed Nets among Pregnant Women and Associated Factors in Rural Kebeles of Hulbareg Woreda, Silte Zone, Central Ethiopia Region, Ethiopia.

Summary

Background: Insecticide-treated nets (ITNs) have become widely recognized as effective instruments for the prevention and management of malaria. Malaria infections during pregnancy pose significant risks to the health of the expectant mother, the fetus, and the newborn. Consequently, the utilization of insecticide-treated nets (ITNs) is among the most commonly recommended strategies for preventing malaria during pregnancy.

Objectives: To assess the Utilization of Insecticide-Treated Bed Nets and associated factors among pregnant women in Hulbarage Woreda.

Methods: A community-based cross-sectional study employing mixed methods was carried out in Hulbareg, Woreda, from January 2 to February 29, 2024. For the quantitative component, a systematic random sampling technique was utilized to select a total of 505 households with pregnant women. Data for the qualitative component were gathered from 12 pregnant women via focus group discussions and subsequently analyzed employing a thematic methodology. Quantitative data were gathered through a pretested questionnaire. The data were subsequently entered and analyzed utilizing the Statistical Package for the Social Sciences software, version 25 for Windows. Bivariate analysis was employed to identify the variables that were correlated with the dependent variable. The multivariate logistic regression model incorporated variables that exhibited a p-value of less than 0.025 in the bivariate analysis, along with a 95% confidence interval for determining significance.

Result: 500 pregnant were participated in the study and about 51% of the participants were at the age of 26 to 35 next to the 36 to 35 age group(21%) and 18 to 25 age group (20%). Of the total respondents, 56% of them utilize insecticide-treated nets. The existence of mosquito breeding location around the house (AOR=1.78, CI:1.105-2.890), family size (4 to 6 members, AOR=0.588, CI:0.3.23-1.069),>6 members, AOR=0.284, CI: 0.047-1.338), educational status (primary AOR = 1.280, CI: 0.569-3.466, high school AOR=2.195, CI: 1.071-4.529), 6 to the last month gestation age of the pregnancy (AOR=0.146, CI: 0.089-0.240), and perception of using

ITN doesn’t cause any problem (AOR=3.58 CI:2.034-6.156) were statistically significant association was identified between the utilization of ITN and pregnant women.

Conclusion: Approximately 56% of pregnant women made use of insecticide-treated nets (ITNs), a figure that falls short of the national target. The need to employ insecticide-treated nets (ITNs) must be made clear to communities and health extension workers. The government and other concerned bodies should give priority to educating pregnant mothers through primary healthcare facilities and implementing focused multimedia effects.

Key terms: - Utilization of ITNs, pregnant woman, malaria-endemic kebeles, Hulbareg, Ethiopia**.**

1. Introduction

1.1. Background

Malaria in pregnant women represents a considerable public health threat to the fetus, the unborn child, and the mother. It can lead to various complications, including intrauterine growth restriction, anemia, low birth weight, and trans-placental parasitemia (1). Pregnancy-associated malaria is a recognized medical emergency that requires hospital treatment to prevent complications and maternal deaths (2,3). Pregnant women face a twofold increase in the risk of mortality from malaria and are three times more susceptible to experiencing severe malaria in comparison to their non-pregnant counterparts (2). Pregnant women and children under the age of five are at a considerably higher risk of developing severe illnesses (1).

Utilizing bed nets that have been treated with insecticide is among the most effective methods for preventing malaria in pregnant women (4,5). If used properly and regularly, it lowers contact and infective mosquito bites by roughly 70%–90% (6). Research has shown that the utilization of insecticide-treated nets (ITNs) in regions where malaria is endemic can lead to a reduction in malaria-related deaths by approximately 20% (7,8). Gamble et al's five randomized controlled studies reveal that intrauterine nutrition (ITNs) can significantly reduce placental parasitaemia, low birth weight, miscarriages, stillbirths, and malaria-related anemia (9).

Even though the majority of sub-Saharan African nations have adopted the WHO guidelines for malaria prevention, the coverage of insecticide-treated nets (ITNs) among pregnant women continues to be inadequate, with 28 million pregnant women lacking access to ITN services. In Ethiopia, the situation is similarly concerning, as only 13% to 51.4% of pregnant women utilize ITNs (10,11), and factors associated with ITNs utilization varied between studies (10,12,13).

Malaria transmission in Ethiopia is predominantly seasonal and irregular, resulting in a significant number of pregnant women being vulnerable to frequent and often extensive outbreaks. Ethiopia's government prioritizes identifying awareness gaps, monitoring behavioral changes, and implementing preventive measures like ITNs for malaria control (14,15). Malaria remains endemic in Hulbareg Woreda; however, there is a lack of data regarding the usage of insecticide-treated nets (ITNs) among pregnant women. This research seeks to evaluate the utilization of ITNs by pregnant women in Hulbareg Woreda, located in Central Ethiopia. The findings of this study were valuable for policymakers and other stakeholders in making informed recommendations and improvements to vector control initiatives, as well as in promoting the use of ITNs.

1.2. Statement of the problem

In 2021, malaria emerged as a significant public health concern, impacting 32% of 40 million pregnancies across 38 countries within the WHO African Region characterized by moderate to high transmission rate (1). In 2021, there was an increase of 1.2 million women at risk of malaria compared to 2020, as the threat of malaria escalated in various countries during that time (1). West Africa had the highest malaria prevalence during pregnancy, with 6.5 million (40.7%) of 16 million pregnant women infected. Central Africa had 39.8% of pregnant women infected. East and southern Africa had a lower prevalence, but higher number of infected women (1).

In 2020, 961,000 neonates with low birth weight were affected by malaria, with 48.5% in West Africa, out of an estimated 505,000 in three sub-regions (1). Malaria infection is responsible for 3.5 percent abortions, 3.2 percent stillbirths, 2.8 percent early neonatal fatalities, 11.5 percent preterm deliveries, and 14.2 percent cases of small for gestational age in primi-gravid women in Mali (16). An estimated 200,000 newborns and 100,000 neonates die each year, with malaria responsible for 18% of all neonatal deaths worldwide (17).

The utilization of ITNs among vulnerable groups, such as pregnant women, remains low, with only 44% of pregnant women in malarious areas sleeping under ITNs in 2015(15). However Asigde Tsimbla in the Tigray Region reported a high utilization rate of 63.1% (18), and Damota Pulasa in Southern Ethiopia recorded a rate of 72.2% (13). A four-year study conducted in Arba Minch reported an average utilization rate of 47.2%(19). Hulbareg Woreda, a major malaria

case source in Central Ethiopia, has provided 100% ITN coverage to all rural kebeles, reducing the risk of malaria (20).

Information is scarce regarding the use of insecticide-treated nets (ITNs) among pregnant women in the Hulbareg Woreda (20). The findings could have significant implications for malaria elimination strategies and provide practical solutions. The objective of the study was to assess the usage of insecticide-treated nets among pregnant women. This study aimed to investigate two specific research questions in consequence:

(1) What is the level of ITN utilization among pregnant women in Hulbareg Woreda and

(2) What are the associated factors influencing its use in the study area?

1.3. Significance of study

The extensive adoption of vector control measures, especially the distribution and proper use of insecticide-treated bed nets (ITNs), has presented a considerable obstacle to the effectiveness of the malaria elimination initiative across the nation in recent decades (13,15,21,22).

Currently, the World Health Organization (WHO) is engaged in an assessment concerning the deployment of a new type of insecticide-treated nets aimed at vector control in malaria-affected nations. The primary goal of this assessment is to formulate policy recommendations or to amend current policies (23).

The objective of this investigation was to evaluate the extent to which pregnant women utilize insecticide-treated nets (ITNs) appropriately, in addition to identify factors that contribute to the challenges encountered in Hulbareg woreda. Consequently, the findings of this study are anticipated to facilitate the identification of deficiencies in ITN utilization and enable the health sector of the woreda to develop suitable interventions aimed at improving the utilization of ITNs among pregnant women residing in the District.

The results of this study have proven to be instrumental in asses the District's progress toward achieving national objectives, as well as in the development and implementation of preventive and control measures. Additionally, these findings have served as a crucial reference for the District Health Office and the community in crafting appropriate strategies to enhance the use of insecticide-treated nets (ITNs) among at-risk populations.

2. LITERATURE REVIEW

The strategy for malaria control on a global scale varies according to the level of endemicity present in each nation. In nations where malaria is highly prevalent, the Roll Back Malaria Strategy is frequently adopted. This strategy consists of various components that aim to efficiently control the disease, promptly diagnose and treat cases, and implement preventive measures. The use of insecticide-treated bed nets (ITNs) has been demonstrated to be exceptionally effective among these measures (7,19).

In Ethiopia, malaria significantly contributes to both illness and death rates (15). The nation hosts four distinct species of malaria parasites, which include *Plasmodium falciparum, P. vivax, P. ovale, and P. malariae*. *Plasmodium falciparum* (PF) and *Plasmodium vivax* (PV) are the two most common species, representing 60% and 40% of malaria cases, respectively. (24). The erratic and seasonal nature of malaria transmission in Ethiopia leads to diminished levels of protective immunity, rendering individuals of all age groups vulnerable to the disease in regions where malaria is prevalent. Approximately 68% of Ethiopia's population resides at altitudes exceeding 2,000 meters above sea level, which are considered susceptible to malaria (23).

According to the National Malaria Strategic Plan of Ethiopia, individuals residing in endemic, high-risk, or moderate-risk malaria zones receive free insecticide-treated nets (ITNs) every three years (23). The implementation of insecticide-treated nets (ITNs) stands out as one of the most crucial approaches to reducing the prevalence of malaria (23)**.** Ethiopia aims to ensure that all insecticide-treated nets (ITNs) are distributed, with 80% of these nets being utilized in regions susceptible to malaria transmission (23)**.**

2.1. Malaria in pregnancy

Pregnancy-associated malaria represents a significant global health concern, particularly in the sub-Saharan African region (25). An estimated 125 million pregnant women are believed to be at risk of contracting P. falciparum each year, which may lead to complications such as anemia, stillbirth, abortion, and neonatal mortality, potentially contributing to maternal mortality (26). A study indicated that the prevalence of malaria during pregnancy was 41.6% (27), compared to rates of 13.7% (28), 18% (29), and 19.8% (30), in Sudan, Burkina Faso, and Malawi, respectively. Pregnancy-related malaria prevalence in Ethiopia ranges from 6.1% to 10.4% (31).

2.2. Strategies for malaria control

According to National Malaria Strategic Plan of Ethiopia, insecticide-treated nets (ITNs) are distributed at no cost to individuals residing in malaria-endemic regions every three years. Using ITNs is a crucial strategy in the fight against malaria (23). Ethiopia seeks to guarantee the availability of insecticide-treated nets (ITNs) to all individuals residing in malaria-prone regions, ensuring their consistent and proper utilization (32).

The World Health Organization advocates for the use of insecticide-treated nets (ITNs) and indoor residual spraying (IRS) as effective measures to prevent mosquito bites. As of 2018, 72% of households in sub-Saharan Africa possessed at least one ITN, and approximately 57% of the population had access to an ITN. Furthermore, 40% of the population resided in households that had a sufficient number of ITNs to accommodate all members (33).

2.3. Utilization of ITN

According to research done in Uganda's Gulu District, only 35% of pregnant women used ITN (34). Similarly, Senegal's utilization rate was found to be 46.84% (35), while the Nigerian Etsako District reported 86.1% (34). Befor to the survey, ITN use was reported by 66.1% of participants in a rural investigation carried out in the Southwest Region of Uganda (36).

In Ethiopia, insecticide-treated nets (ITNs) utilization increased from 32% in 2007 to 40% in 2015, according to the Malaria Indicator Survey. (18). Another cross-sectional survey found that just 22.2% of pregnant women in the Raya Azebo District had ever slept with an ITN (37). Similarly, studies carried out in Shashogo Woreda, Hadiya Zone, southern Ethiopia, showed that just 7.5% of participants used ITNs appropriately (24). On the other hand, Damota Pulasa, located in southern Ethiopia, reported a 72.2% utilization rate (38), whereas Asigde Tsimbla in the Tigray Region reported a higher rate of 63.1% (13), 47.2% was the average utilization rate according to a four-year research done in Arba Minch (19).

A study conducted in the southwestern Oromian District of Chewaka has identified a gap in the existing literature, indicating that there is no evident relationship between illiteracy and attendance in secondary schools (39). The findings indicated that the utilization of ITNs in the Awabel District was associated with individuals aged over 35 as well as the proximity to healthcare facilities (17).

2.4. ITNs utilization among pregnant women

In response, the Ethiopian Government has enacted strategic initiatives aimed at curbing the transmission of malaria (23). The nation has also implemented environmental management strategies and the use of larvicides in mosquito breeding areas as additional vector control measures (23,40).

Ethiopia has successfully implemented indoor residual spraying and insecticide-treated nets (ITNs) to control malaria transmission in areas with extended transmission periods over the past five years (23). In 2021, the global delivery of insecticide-treated mosquito nets (ITNs) has surged, with manufacturers delivering 220 million LLINs, or long-lasting insecticidal nets (41). By 2021, 68% of households in sub-Saharan Africa possessed at least one insecticide-treated net (ITN), a significant increase from approximately 5% in the year 2000 (41). The percentage of households possessing at least one insecticide-treated net (ITN) for every two individuals increased significantly from 1% in the year 2000 to 38% in 2021. Concurrently, the proportion of individuals with access to an ITN within their homes grew from 3% to 54% over the same period (1).

Between the years 2000 and 2021, there was a notable rise in the utilization of insecticide-treated nets across various demographic groups, especially among children under the age of five and pregnant women, with usage increasing from 3% to 53% (43). Overall, ITN use and access are still lower than they were in 2017 (42). The proportion of households that possess at least one insecticide-treated net (ITN) nationwide has remained relatively low, with rates of 65% in 2007, 55% in 2011, and 64% in 2015, according to a study on malaria epidemiology and intervention in Ethiopia (43). In a similar vein, the National Malaria Indicator Survey carried out in 2015 revealed that 64% of households had access to an insecticide-treated net (ITN) (43).

A research study carried out in Arbaminch indicated that 58.8% of households owned at least one insecticide-treated net, while only 28.9% had two. In comparison, in northern Ethiopia, the proportion of families possessing two such nets was a mere 17% (44). Nonetheless, a study carried out in the southern Ethiopian district of Wolaita, Damot Pulasa, showed that 89% and 100% of pregnant women's households reported having at least two ITNs, respectively (13). These numbers were discovered to be greater than those mentioned in related studies (13,21,40).

The 2018 World Malaria Report showed that high-risk populations for malaria, especially pregnant women, were using insecticide-treated nets (ITNs) at a significantly higher rate. Pregnant women who slept with ITNs had a higher percentage in 2017, 61% than in 2010 (26%) (45). In Ethiopia, there was a slight rise in the utilization of insecticide-treated nets (ITNs) among pregnant women from 2011 to 2015 (45). A survey indicated that merely 44% of pregnant women residing in high-risk areas utilized an insecticide-treated net (ITN) the night There exists a disparity in the utilization of insecticide-treated nets (ITNs) based on the residential location of pregnant women, with those in rural areas employing ITNs at a lower frequency compared to their urban counterparts (21). Additionally, pregnant women living in urban areas and households in the wealthiest quintiles had the highest rate of ITN utilization (21,40).

A study conducted in Zambia revealed that merely 46 percent of pregnant women utilized insecticide-treated nets (ITNs) for sleeping (46). The fact that nearly half of the African population at risk for malaria relies on insecticide-treated nets (ITNs) for protection is concerning. In 2017, the proportion of individuals safeguarded by this intervention increased to almost 50%, marking a notable enhancement from the 29% recorded in 2010 (40). Furthermore, from 33% in 2010 to 56% in 2017, the percentage of the population with access to ITNs treated with pesticide increased (40). It is important to note, though, that coverage has not changed much since 2015 and has not changed at all since 2016 (40,46).

In several Ethiopian localities, including Damot Pulasa in the Wolaita zone of Southern Ethiopia, Raya Azebo in Northern Ethiopia, Halaba Kulito, and rural communities of Arbaminch, an investigation was conducted regarding the utilization rate of insecticide-treated nets (ITNs) by pregnant mothers. Findings revealed that in Damot Pulasa, Raya Azebo, Halaba Kulito, and the rural villages of Arbaminch, the rates of ITN utilization among pregnant women were 72.5% (13), 58.4% (21), 54.1% (47), and 35% (44), respectively. Furthermore, a different study carried out in the Arbaminch region show that 35% of pregnant women used ITNs (13,21,32,48)

2.5. Factors associated with ITN utilization

2.5.1. Socio-demographic factors

A study carried out in the Northern Region of Ghana indicates that individuals residing in rural areas are 87% more likely to possess an insecticide-treated net (ITN) compared to their urban counterparts (38). Furthermore, the research reveals that women living in rural regions are more inclined to own an ITN than those residing in the regional capital (38).

A Cameroonian study indicates that there is a positive correlation between the number of individuals residing in a household and the utilization of insecticide-treated nets (ITNs) (49). The likelihood of a household having an individual capable of informing others about the advantages of utilizing ITNs increases as the number of residents grows (49). According to a study done in Ethiopia's rural Gedeo Zone, variables including age, place of residence, (50), family size, educational status, and occupation (19,51), have a significant impact on the utilization of ITNs.

2.5.2. Educational and organizational factors

A study in southern Ethiopia found that pregnant women with malaria transmission awareness are 6.9 times more likely to use insecticide-treated nets (13). Furthermore, pregnant women who have previously experienced malaria during pregnancy are 3.7 times more likely to use ITNs as opposed to those who have not encountered malarial infection during pregnancy (13). Another study conducted in Halaba Kulito has demonstrated that the utilization of ITNs is significantly associated with educational status(13). Pregnant women who have received primary education are 5 times more likely to use bed nets than those who have not received any education (15). Health education provided by health extension workers and knowledge about malaria are also factors that influence the utilization of ITNs during pregnancy (52,53).

2.5.3. Environmental Factors

A study conducted in the Belesa District indicated a significant association between types of housing structures and residences with the use of insecticide-treated nets (ITN) among pregnant women (54). Similarly, studies carried out in Arba Minch rural surrounding, Gedeo Zone Dilla surrounding woreda, and Adami Tulu have indicated that previous exposure to malaria (52,53) breeding site (55), can affect the proper utilization of ITN. A study in Halaba Kulito District

reveals that bedroom condition, educational status, and distance from health facilities significantly influence ITN utilization among pregnant women (15). Research conducted in the Asigde Tsimbla District of the Tigray Region revealed that variables including place of residence, family size, previous experiences with malaria, and perceived severity significantly affect the utilization of insecticide-treated nets (ITN) during pregnancy (12).

2.6. Conceptual framework

The uses of ITN among Pregnant women are influenced by different factors; like Socio-demographic factors, Environmental factors, Educational and Organizational factors, and other factors.

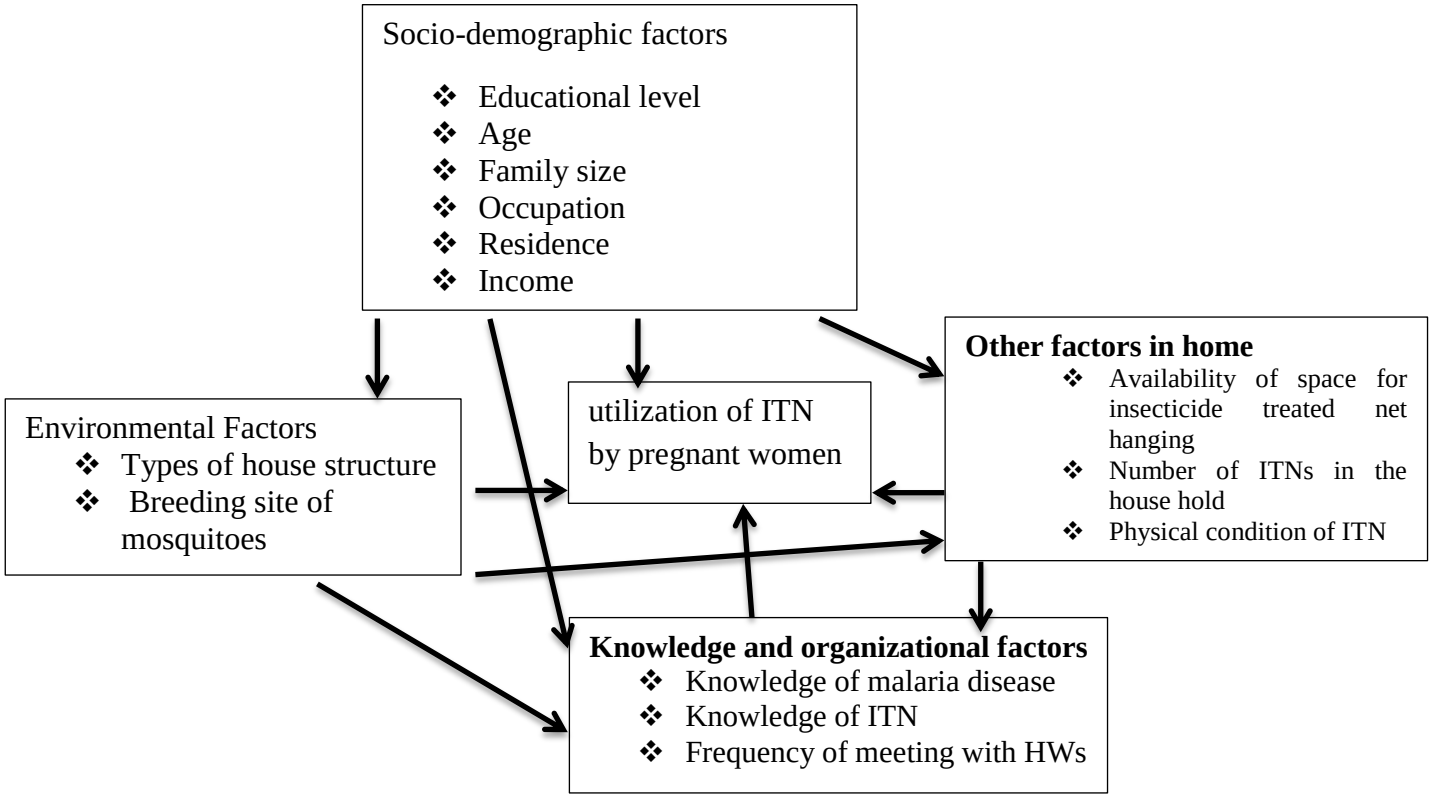

Figure 37:- The study presents a conceptual framework for assessing insecticide treated net utilization and associated factors among pregnant women in Hulbareg Woreda, Central Region Ethiopia, 2023, based on various literature sources (13,53)

3. Objective

3.1. General Objective

- To assess utilization of insecticide-treated net among pregnant women and associated factors in the rural community of Hulbareg Woreda, Central Ethiopia Region, Ethiopia, 2024.

3.2. Specific Objectives

- To assess the utilization of insecticide-treated nets among pregnant women in the rural community of Hulbareg Woreda, Central Ethiopia Region, Ethiopia.
- To identify factors associated with ITN utilization among pregnant women in the rural community of Hulbareg Woreda, Central Ethiopia Region, Ethiopia.

4. Methods and materials

4.1. Study Area

A mixed method community-based cross-sectional study was conducted in Hulbareg Woreda, located around 188 km southwest of Addis Ababa and along the route to Hossana Town. The estimated total population of the woreda in 2023 was 94,223, with 46,622 (49.5%) males and 47,601 (50.5%) females based on projections from the 2007 national census (56). In Woreda, there were 3261 (3.4%) urban dwellers. 3260 pregnant women, or 3.46% of the total Woreda population, were estimated to exist. Hulbareg Woreda is organized into 11 Kebeles, comprising one urban Kebele and ten rural Kebeles. The Hadiya Zone borders the Woreda to the southwest; Misraq Azernet Berbere borders it to the west; Alicho Werero borders it to the north; Silte borders it to the northeast; Dalocha borders it to the east; and Sankurra borders it to the south.

Hulbareg Woreda has two main agroecological zones: "dega" (cool temperate highlands above 2,300 meters) and "kolla" (lowlands between 1500 and 2300 meters). The average annual temperature is 21 degrees Celsius, with 1200 mm of rainfall.

The Woreda district has 41 permanent and 1,436 transient mosquito breeding sites, eleven health posts, four health centers, three medium clinics, three primary clinics, three rural drug vendors, and one private health facility, Health Service coverage is100% of the area in 2022 (20).

The 2015 EFY malaria caseload in Hulbareg Woreda was 26104, with 4416 positive cases (16.9%). The most common plasmodium species was PF, accounting for 2870 cases, and PV for 1546. The annual incidence of parasitic malaria was 47.8/1000 people, with Anopheles arabiensis being the main vector(20).

In 2021, 32,900 ITNs were distributed and IRS was sprayed in Hulbareg Woreda, as part of a malaria prevention strategy, alongside early diagnosis and treatment (20).

Five of the ten rural kebeles in the Hulbareg Woreda of the Silte Zone, in the Central Ethiopia Region Bilewanija kebele, Demeke kebele, Achamo kebele, Gimba kebele, and Tode kebele will be the subject of this study.

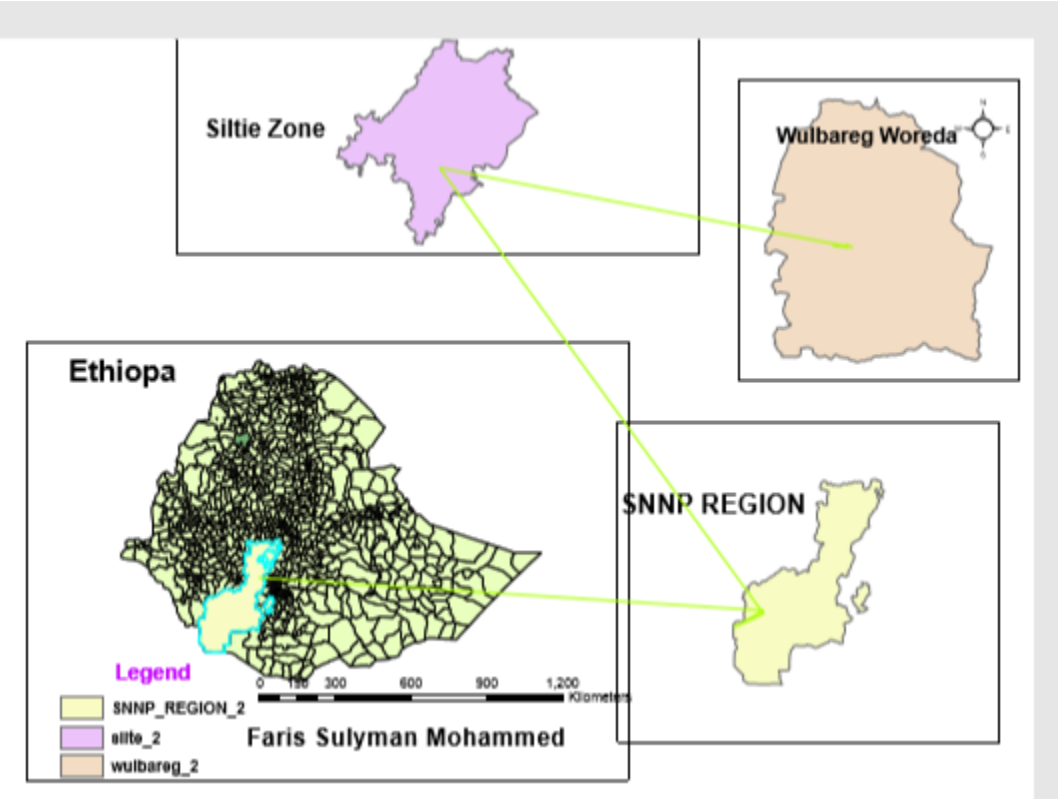

Figure 38:-Map of Hulbareg Woreda Silte, Zone, Southern, Nation, Nationalities Peoples, Region, Ethiopia, 2024.

4.2. Study design and period

4.2.1. Study period

The study was conducted between January 2, and February 29, 2024, GC.

4.2.2. Study design

In rural Kebeles of Hulbareg Woreda, Central Ethiopia Region, Ethiopia, we conducted a mixed-method community-based cross-sectional study and collected data using interviewer-assigned pretested, structured questionnaires in 2024.

4.3. Population

4.2.3. Source population

All pregnant women residing in the rural kebeles of Hulbareg Woreda.

4.2.4. Study population

For the quantitative part

The study population was comprised of pregnant women who were randomly selected from Hulbareg Woreda.

For the qualitative part: - The study population comprised of randomly selected pregnant women for focused group discussions in Hulbareg, Woreda.

4.2.5. Sampled population

All selected pregnant women from January 2–February 29/2024 GC.

4.4. Inclusion & exclusion criteria

4.4.1. Inclusion criteria

All pregnant mothers who owned at least one ITN(s) for the sample and who lived for at least six months in the District.

4.4.2. Exclusion criteria

All pregnant women who experienced illness during the data collection period and were unable to provide responses were excluded from the study.

4.5. Sampling technique and procedure

The method used for sampling in this study was systematic random sampling. Five rural kebeles were chosen, using the SRS technique (lottery method) out of the ten rural kebeles in Hulbareg Woreda to represent all rural kebele in the study area (Figure 39).

A sample size allocation proportional to probability was conducted for each kebele, taking into account the total number of households with pregnant women. A sampling frame of households with pregnant women was established based on the identification and registration of these individuals for antenatal care (ANC) follow-up at their respective health posts. Consequently, a total of 505 households with pregnant women were selected using a methodical and systematic sampling approach among the study participants (Tab 33).

4.6. Sample Size Determination and Sampling Procedure

4.6.1. Sample Size Calculation for the First Objective

A formula designed for a single population was employed to ascertain the sample size. The calculation of the population proportion, p, was based on data from the Damota Pulasa District in southern Ethiopia, where p represents the proportion of households utilizing insecticide-treated nets (ITNs) for pregnant women, with the assumption that they sleep under such a net. The value of p was determined to be 0.725 (13).

The following formula was employed.

$$n = \frac{(z\alpha/2)2 * p\ (1-p)}{d^2} \quad n = 3.8416 * 0.725 * 0.275 / 0.0025 = 306$$

Where:-

n= sample size

CI=95% (confidence interval).

d= 5% (margin of error)

Then, 306*1.5(design effect) =459 and by adding 10% non-response rate=505

4.6.2. Calculation of the sample size for the second objective

It was determined by using Epi.info, the study finding obtained from Adama Woreda, Oromia Ethiopia (factors associated with ITN utilization among pregnant women) (57)

Table 32: Shows the factors associated with ITNs utilization among pregnant women.

s/no	(associated factors)	CI	AOR	% of exposed	Power (80)	Design effect	Non response rate	Final sample size
1	ITN Ownership	95%	2.42	50.9	80	1.5	10%	314
2	Lack of information ITN	95%	2.61	52.8	80	1.5	10%	267
3	Knowledge of ITN	95%	3.14	57.4	80	1.5	10%	**122**

Calculated sample size for objective one=505 was considered as largest; hence it was final sample size.

Table 33: Sample size distribution by kebele for the use of LLITNs and related factors among pregnant women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, 2024.

s/no	Kebele name	Kebele Population	Number of PW (3.46%)	Sample size per selected kebele (30.3% of PW)
1	Bilewanija	11,630	402	122
2	Demeke	10679	369	112
3	Tode	8452	292	88
4	Ambericho Gimba	8180	283	86
5	Amberich Achamo	9236	320	97
	Total	48177	1667	505
	PW = Pregnant Women			

The proportion-to-size stratum sampling method was ultimately employed to ascertain the number of pregnant women to be interviewed in each kebele, achieved by dividing the total number by the sample size of 505.

4.6.3. Sampling procedure

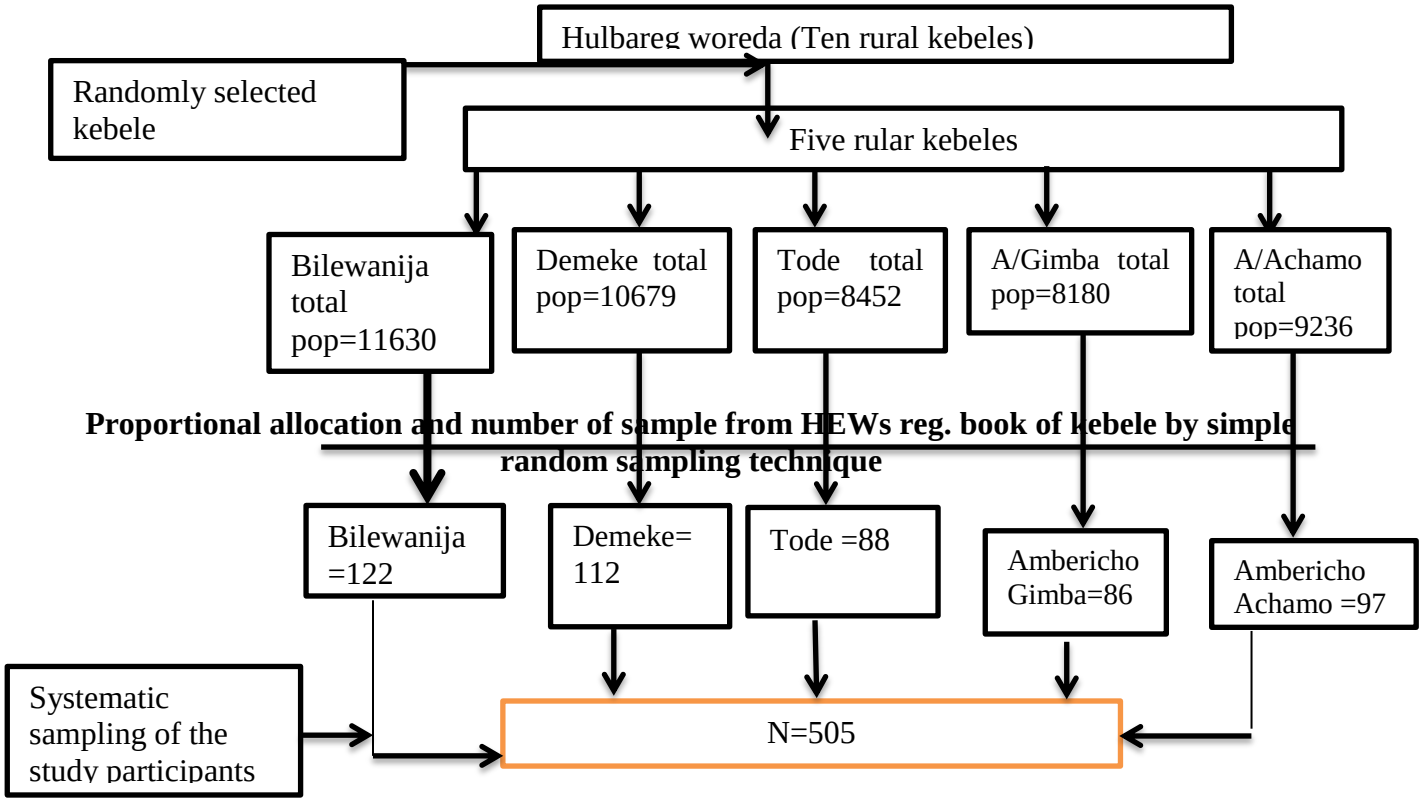

Figure 39: Schematic representations of the sampling procedure for ITN utilization among pregnant women in Hulbareg Woreda, Silte Zone, Central Ethiopia Region, 2024.

Adapted from different literature with a few modifications (13,44)

4.7. Variables of Study

4.7.1. Dependent variable

- Utilization of ITNs among pregnant women

4.7.2. Independent Variables

Socio-demographic factors

- Sex
- Age
- Marital status
- Family size
- Occupation
- Residence

Environmental factors

- Types of the house structure
- Breading site

Knowledge and organizational factors

- Knowledge of malaria
- Knowledge of ITNs
- Information of ITN

Other factors in home

- Availability of space for ITN hanging
- Number of ITN in the household
- Experienced fever due to malaria

4.8. Operational Definitions

Pregnant women: refer to individuals experiencing a maternal condition characterized by the presence of a developing fetus within the uterus. During the survey, these individuals were identified as being pregnant (13).

Insecticide-treated net (ITN) : is defined as any long-lasting insecticidal net (LLIN) designed to kill, repel, or block mosquitoes physically that has been planned to remain effective for more than three years without retreatment (58).

ITN utilization- is defined as when study subjects responded positively as having slept under the ITN in the night preceding data collection day (12,14).

Proper utilization of ITNs: hanging and putting ITNs all around the mattress properly in a way that doesn't allow entry of mosquitoes (13).

Proper hanging of ITN: hanging and putting ITN all around a mattress with no entry for biting mosquitoes (13).

Good knowledge: number of mothers who responded above the average of knowledge questions (13).

Proper care of ITN: washing the nets using only soap at three-month intervals and drying under the shadow (13).

Mosquito breeding site: is a site which were is stagnant water in the surrounding of households (13).

4.9. Data collection tools and procedures

Data were gathered through both quantitative and qualitative methods utilizing pre-tested questionnaires. The design of the questionnaire was informed by the independent variable identified in the literature and was adapted from existing questionnaires (53). The questionnaire was initially developed in English, subsequently translated into the local language, Amharic, and then translated back into English to verify its reliability. For the qualitative component, an open-ended question focusing on the use of ITN and related factors was employed.

Six health workers (Diploma holders) were used to collect data, and one supervisor (Degree holder) was also an employee to follow up on the data collection process. Two days of training have been given to data collectors and the supervisor on the purpose of the study and data collection procedures. For the qualitative part, FDGs were also used, which included 10–12 members of the pregnant.

4.10. Data quality control

Data collectors and supervisors received training on data collection, with experienced researchers verifying checklist validity. Daily data completeness and consistency were checked, with incomplete data excluded. Data cleaning was performed, and a pretest was carried out using 5% of the total sample in rural Kebeles.

4.11. Data processing and Analyzing

The questionnaires were pre-tested in a comparable environment, but outside of particular rural kebeles befor to the actual data gathering. For two days, supervisors and data collectors received training on questionnaire details, procedures, ethical considerations, and other topics. The process of gathering data was continuously observed by the lead investigator. Daily consistency and completeness checks were performed on completed questionnaires. Coded data were gathered using KoboToolbox, exported to Excel, subsequently exported to Excel, and then transferred to SPSS Version 25 for analysis.

To evaluate the related factors, descriptive statistics were performed, and both bivariate and multivariate logistic regressions were utilized. Frequencies and cross-tabulations were utilized with the software to look for variables and values that were overlooked. To determine which variables are specifically related to the dependent variable, a bivariate analysis was employed. Variables with a p-value below 0.05 in the bivariate analysis were the sole candidates included in the multivariate logistic regression model, which consequently restricted the overall number of variables considered. P-values under 0.05 were regarded as significant across all analyses and are presented as adjusted odds ratios (AOR) accompanied by 95% confidence intervals.

4.12. Ethical Consideration

The proposal received approval from the Institutional Review Board (IRB) at the Addis Ababa University College of Health Sciences, School of Public Health, prior to the commencement of data collection. The privacy of the respondents and the confidentiality of the information were meticulously safeguarded.

All individuals involved in the study were made aware during the data collection process that their participation was entirely voluntary and that they had the right to withdraw their consent at

any point, including after the commencement of the interview. Participants were provided with the principal investigator's contact information for any inquiries they might have. Data collection was conducted using codes, ensuring that no personal identifiers, such as names, were requested. Furthermore, all confidential information was safeguarded.

4.13. Dissemination of findings

The results were given to the School of Public Health College of Health Sciences, Addis Abeba University (AAU). Following that, an effort was made to present it at the Central Region Health Bureau's annual and biannual meetings, as well as other meetings in the region that are related to malaria. Furthermore, attempts were undertaken to showcase the findings at scientific conferences and to publish the results. Reports were submitted to the Central Ethiopia Region Health Bureau, the Silte Zone Health Department, the relevant Woreda health office, the AAU School of Public Health, and the sponsoring organization.

4.14. Qualitative part

4.14.1. Methodology:-

This study aimed to explore the utilization of insecticide-treated nets among pregnant women through a focus group discussion (FGD) approach. The (FGD) method was chosen as it allows for an in-depth exploration of participants' experiences, perspectives, and practices regarding ITN utilization during pregnancy

4.14.2. Participant selection:-

A total of 12 pregnant women were chosen to take part in the focus group discussion. Participants were recruited using purposive sampling, specifically targeting pregnant women who have utilized insecticide-treated nets (ITNs). Steps were taken to ensure a diverse representation among participants regarding age, socio-economic status, and educational background, aiming to encompass a variety of viewpoints.

4.14.2. Data collection procedure:-

The focus group discussion was conducted in a comfortable and private setting, ensuring confidentiality and creating an open atmosphere for discussion. The session lasted approximately

1.5 to 2 hours. A trained moderator was facilitator the discussion, while a note-taker documented key points and non-verbal cues.

The discussion followed a semi-structured interview guide developed specifically for this study. The guide includes open-ended inquiries and prompts, enabling participants to articulate their experiences, perceptions, and challenges associated to ITN utilization during pregnancy. The moderator encouraged participants to provide detailed responses and challenges and engage in a group discussion to explore varying perspectives.

4.14.3. Data analysis

The focus group discussion was recorded in audio format, transcribed word-for-word, and subsequently analyzed through thematic analysis. The transcripts underwent multiple readings to uncover recurring themes, patterns, and insights concerning the use of insecticide-treated nets (ITNs) among pregnant women. The analysis involved coding the transcripts and organizing the data into significant themes. The concept of data saturation, defined as the point at which no new themes arise, was utilized as a criterion for assessing the sufficiency of the sample size.

4.14.4. Ethical consideration:-

Ethical considerations were carefully addressed throughout the study. Informed consent was obtained from each participant, clearly explaining the purpose of the study, their rights, and the volunteer nature of participation. Participant's identities were randomized throughout the study, and their confidentiality was maintained during data collection, analysis, and reporting. The research ethics committee conducted a review and approved study protocol.

5. Result

This section consists of two parts, the descriptive and inferential results. Descriptive results are used to describe the socio-economic, demographic, and environmental-related variables of the study participants.

5.1. Quantitative part

5.1.1. Socio-demographic characteristics of study participants.

In this research, a total of 505 pregnant women participated in the interviews. However, five of these women were unable to complete the interview due to personal circumstances. Consequently, the final analysis included responses from 500 pregnant women, resulting in a response rate of 99%.

Looking at the age of the respondents, among those aged 18 to 25, 24.1% use ITN, while 15.3% don't, making up 20.2% of the total respondents. In the 26 to 35 age group, 65.1% use ITN, with 50.9% not using it, totaling 58.8% of the respondents in this age group. For respondents aged 36 to 45, 10.8% use ITN and 33.8% don't, constituting 21.0% of the total respondents (Table 34).

Regarding the education status of the respondents, of those with no education, 28.1% use ITN, and 64.4% don't, making up 44.2% of the total participants. Respondents with primary education: 64.4% use ITN, 30.6% don't, totaling 49.4%. High school educated: 7.2% use ITN, 5.0% don't, making up 6.2% of the total. Only one respondent with education above grade 12 has participated in this research, and she is found to use ITN.

Regarding the main occupation of the respondent, among governmental employees, 3.2% use ITN, while 0.9% don't, making up 2.2% of the total respondents. From those respondents whose main occupation is housewife, 84.5% use ITN and 84.7% don't, totaling 84.6%. Among pregnant women who are mainly engaged in trading, 12.2% use ITN and 14.4% don't, making up 13.2% of the total.

On the other hand, looking at the family size of the respondents, among families with less than 3 members, 25.9% use ITN and 23.4% don't, making up 24.8% of the total respondents. In families with 4 to 6 members, 67.6% of them use ITN, while 45.0% of them don't, totaling 57.6%. In

families with more than six members, 6.5% use ITN and 31.5% don't, constituting 17.6% of the total.

Table 34: socio-demographic characteristics of the pregnant women in Hulbareg Woreda, Central Region, Ethiopia, 2024.

Variables	Response categories	Using ITN	
		Count	Percent
Age of respondents	18 to 25	77	24.1
	26 to 35	181	65.1
	36 to 45	30	10.8
Education status	No education	78	28.1
	Primary	179	64.4
	High school	20	7.2
	Above 12	1	0.4
Occupation	Governmental Employee	9	3.2
	House wife	235	84.5
	Merchant	34	12.2
	Farmer	0	0.0
Family size	Less than 3	72	25.9
	4 to 6	188	67.6
	Greater than 6	18	6.5

5.1.2. Respondent characteristics and utilization of ITN

Regarding utilization of ITN, as shown in figure 4 below, among the total respondents, about 56% (278) of the respondents used insecticide-treated nets (ITN), while 44% (222) did not.

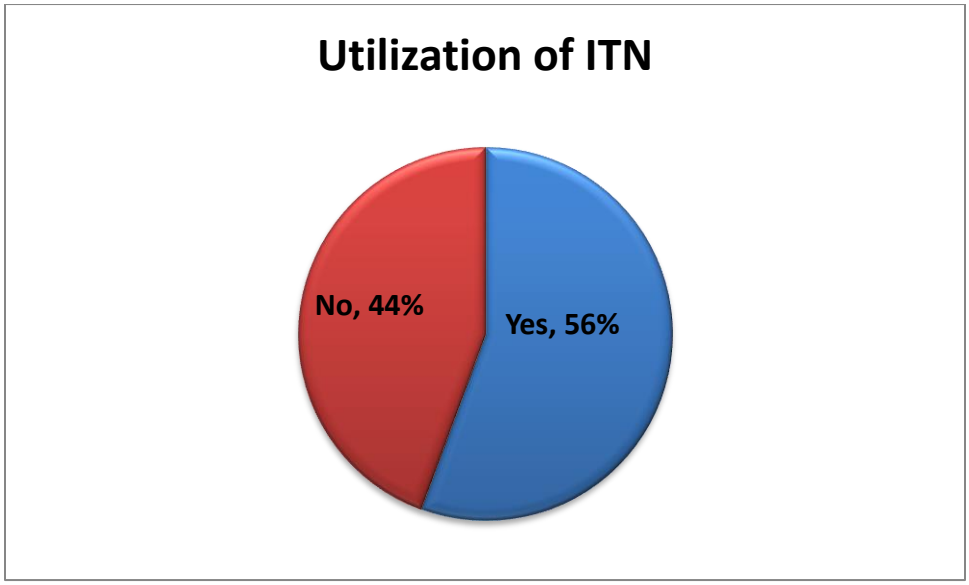

Figure 40:- Utilization of ITN among pregnant women in Hulbareg woreda, Central Region, Ethiopia, 2024.

The information gathered on previous pregnancies showed that the majority of respondents (94.2%) had been pregnant before, while only 5.8% responded that this was their first pregnancy. The variable regarding gestational age, among the total respondents, 16.2% of them were in the 1–3 month range of gestation, 29.2% were in the 4–5 month range, and 54.6% of them were 6 months and above. Almost all respondents (98.0%) attended ANC during their current pregnancy, while only 2.0% did not. Among those who attended ANC, the frequency of the visit varies accordingly. 5.1% went once for ANC, 12.9% went twice, 20.0% went three times, 20.8% went four times, 15.3% went five times, and 25.9% of them went more than six times. According to respondents, ITNs were perceived as highly effective in preventing malaria, with 96.8% reporting that ITNs prevented malaria, while only 3.2% disagreed.

Table 35: Respondent characteristics and utilization of ITN among pregnant women in Hulbareg woreda, Central Region, Ethiopia, 2024.

Variables	Response category	Count respondents (N)	Percent (N %)
Presence of pregnancy before	Yes	471	94.2
	No	29	5.8
Gestational age of current pregnancy	1 to 3 months	81	16.2
	4 to 5 months	146	29.2
	6 and above	273	54.6
Attendance of ANC during this pregnancy	Yes	490	98.0
	No	10	2.0
Frequency of ANC visit	Ones	25	5.1
	Two times	63	12.9
	Three times	98	20.0
	Four times	102	20.8
	Five times	75	15.3
	More than 6 times	127	25.9
Effectiveness of ITN	Yes	471	94.2
	No	29	5.8

5.1.3. Environmental, ITN, and other factors in the home.

As shown in the below table 36, a significant portion of respondents (64.0%) reported the existence of mosquito breeding sites near to their houses, while the remaining respondents (36%) reported that there are no mosquito breeding sites around their houses. Regarding the method used to prevent malaria transmission, among respondents, the most common methods cited for preventing malaria transmission were using ITNs (50.8%) and drug prophylaxis (26.8%). Some respondents also mentioned the combined use of ITNs and other methods like DDT spraying or drug prophylaxis. Looking at the presence of ITN binding, hanging, and ownership of ITNs, the majority of households (98.4%) had ITN binding or hanging areas, with hanging areas for ITNs reported in almost all households. Additionally, households typically owned multiple ITNs, with 56.2% having three or more, 25.8% having two ITNs, and 18% owning only one ITN.

Respondents were asked about their perceptions of who could give priority in malaria prevention among household members. Accordingly, respondents believed that pregnant women should be given the highest priority in malaria prevention within households (63.8%), followed by adults

(23.0%), under-five children (12.6%), and a very small percentage mentioned old age (0.6%). Similarly, respondents were also asked about their perception of whether using ITN causes a problem or not, and about 24% of respondents reported yes, while the remaining said don't. Among the respondents who reported yes, common issues raised were heat (36.4%) and lack of comfort (40.7%). However, a smaller percentage (22.9%) reported issues related to air protection while sleeping.

Table 36: Environmental, ITN, and other factors for pregnant women in Hulbareg Woreda, Central Region, Ethiopia, 2024.

Variables	**Response category**	**Count of response (N)**	**Percent (N %)**
The presence of mosquito breeding sites around the house	Yes	320	64.0
	No	180	36.0
Methods to prevent malaria transmission	By using ITN	254	50.8
	By DDT spraying	1	0.2
	Drug prophylaxis	134	26.8
	By using ITN and By DDT spraying	16	3.2
	By using ITN and Drug prophylaxis	63	12.6
	By DDT spraying and Drug prophylaxis	29	5.8
	By using ITN, Drug prophylaxis and Drug prophylaxis	3	0.6
Number of ITNs owned by households	One	90	18.0
	Two	129	25.8
	Three and above	281	56.2
Presence of binding/hanging area of ITN	Yes	492	98.4
	No	8	1.6
Household members given priority in malaria prevention	Pregnant women	319	63.8
	Adults	115	23.0
	Old age	3	0.6
	Under five children	63	12.6
Causes of using ITN	Protects air	27	22.9
	Causes heat	43	36.4
	Causes discomfort	48	40.7

5.1.4. Bivariate analysis of factors associated with ITN utilization.

In the bivariate analysis result presented in Table 37 below, among the study variables, maternal age (COR=2.25), maternal education (COR=0.31), family size (COR=1.97), gestational age of the pregnancy (COR=0.29), experiencing malaria attack during the current pregnancy (COR=0.38), awareness of malaria symptoms (COR=3.64), presence of mosquito breeding sites around the house (COR=2.51), and perception of getting problems when using ITN (COR=0.35) were factors found to have a statistically significant association with the ITN utilization of pregnant women at a p-value < 0.025.

Table 37: A bivariate logistic regression analysis examining the factors influencing the utilization of insecticide-treated nets (ITNs) among pregnant women in Hulbareg Woreda, located in the Central Region of Ethiopia, in the year 2024.

Variables (Factors)	Response categories	P. Value	COR	95% C.I.	
				Lower	Upper
Age category of the respondent	18 to 25	0.000			
	26 to 35	0.392	1.230	0.765	1.978
	36 to 45	0.000	4.926	2.727	8.898
Education status of the respondent	No education	0.000			
	Primary	0.000	0.207	0.140	0.307
	High school	0.003	0.300	0.137	0.658
	Above 12	1.000	0.000	0.000	
Family size of the HH	Less than 3	0.000			
	4 to 6	0.165	0.736	0.478	1.134
	Greater than 6	0.000	5.385	2.871	10.099
Gestational age of current pregnancy	1 to 5 months	0.000			
	6 to 10 months	0.000	0.112	0.052	0.241
Experience malaria attack	Yes (Ref)	0.000			
	No	0.042	0.384	0.152	0.968
Aware of symptom of malaria	Yes (Ref)	0.000			
	No	0.001	3.648	1.654	8.042
Presence of mosquito breeding site around the house	Yes (Ref)	0.000			
	No	0.000	2.519	1.733	3.663
Perceived problems using ITN	Yes (Ref)	0.000			
	No	0.000	0.359	0.234	0.550

5.1.5. Multiple logistic regression analyses of factors associated with ITN utilization.

The multivariate logistic regression finding revealed that, for pregnant women who responded there is mosquito breeding site around their house, they have 1.7 (1.11,2.89) times more likelihood of using ITN than pregnant women who responded no mosquito breeding site around their house. Families with household member size 4 to 6 (AOR=0.59) with CI (0.32,1.07) have 42% less likelihood of using ITN than households who have less than 4 members and households with greater than 6 members (AOR=0.28) with CI (0.0.05,1.34) have 72% less likelihood of using ITN than households who have less than 4 members.

Pregnant woman's who attended primary education and high school have 1.28 (0.57, 3.47) times and 2.19 (1.07,4.53) times more likelihood of using ITN respectively than woman's who did never attend education. Pregnant woman's who don't perceive using ITN causes a problem have 3.5 (2.03, 6.16) times more likelihood of using ITN than who said using ITN causes a problem. On the other hand, pregnant woman's who are on the 6-to-10-month gestation period (AOR=0.15) with CI (0.09, 0.24) have 85% less likelihood of using ITN than who are 1 to 6 months of gestation period (Table 38).

Table 38: Multiple logistic regression analysis of factors associated with ITN utilization among pregnant women in Hulbareg Woreda, Central Region, Ethiopia, 2024.

Variables	**Response categories**	**Sig.**	**AOR**	**95% C.I**	
				Lower	**Upper**
Presence of mosquito breeding site around the house	No (Ref)		1		
	Yes	0.018	1.79	1.11	2.89
Family size of the HH	Less than 4	0.000	1		
	4 to 6	0.082	0.59	0.32	1.07
	Greater than 6	0.000	0.28	0.05	1.34
Education status of the respondent	No education	0.000	1		
	Primary	0.000	1.28	0.57	3.47
	High school	0.001	2.20	1.07	4.53
	Above 12	1.000	0.00	0.00	
Does sleeping under bed net cause any Problem?	No	0.000	3.54	2.03	6.16
	Yes (Ref)	0.000	1		
Gestational age of current pregnancy	1 to 5 months	0.000	1		
	6 to last months	0.000	0.15	0.09	0.24
	Constant	0.000	11.64		

5.2. Qualitative part results

5.2.1. socio-demographic characteristics of the participants.

Twelve people in all took part in the conversation in the FGDs. Every participant in the focus group discussions belonged to Silte ethnicity. The pregnant mothers were all from rural areas. The ages of the participants varied from 20 to 32. Eight of the individuals had never attended formal schooling, and four had only completed sixth grade. All the study participants were Muslims.

The qualitative data were summarized into two primary themes: utilization status of insecticide-treated nets by pregnant women, and factors influencing utilization of ITN by pregnant women in the study area.

ITN Utilization status

25-year-old woman Mostly, we used nets when malaria starts and during the rainy season when mosquitoes come back. We do not use nets during the winter because mosquitoes are not seen in the house (ID-002).

A 27-year-old woman who was not using insecticide-treated nets mentioned that she did not use the nets because it irritated her. She also stated that some people use insecticide-treated nets for aim other than intended, such as using them as press grain straw and ropes (ID-009).

One pregnant mother, aged 26, emphasized the importance of preventing malaria transmission through the proper utilization of insecticide-treated nets, draining stagnant water, and maintaining environmental sanitation (ID-001).

Additionally, a 25-year-old woman suggested that malaria control can be achieved by spraying insecticides and ensuring windows are properly screened (ID-001).

Factors associated with ITN use.

A 30-year-old pregnant woman said that she does not use insecticide-treated nets every day since they cause heat and air hanger (ID-005).

A 29-year-old pregnant woman mentioned that various factors impact the daily use of insecticide-treated nets, such as their irritability, quick dirt accumulation, inability to effectively kill mosquitoes, and tendency to generate heat (ID-008).

A 23-year-old pregnant woman suggested enhancing the utilization of insecticide-treated nets by raising awareness on the correct way to hang and use them, conducting regular house-to-house follow-ups by health extension workers, empowering the health development army, and implementing a one-on-five discussion approach. She also proposed that individuals misusing insecticide-treated nets for other purposes should face penalties imposed by community organizations such as elders and the community (ID-011).

6. DISCUSSION

This research showed that the utilization rate of insecticide-treated nets (ITN) among pregnant women in Hulbarag woreda was 56%. This result closely aligns with the outcomes of a study carried out in Gambella (51.4%) (59), as well as Northwest Ethiopia (56.5%) (54), and Damot District (63.1%) (60). Additionally, it is consistence with a review of meta-analyses made of similar research topics in parts of Ethiopia and reviews in sub-Saharan Africa (58.3%) (61), and Rwanda (57.9%) (62). It also shows a higher rate of ITN utilization as compared to the result of studies carried out in Shoshogo District (15.8%) (24), Benishangul (23.1%) (63), Adama (43.1%) (64), and Gida Ayana (37.1%) (65). On the other hand, this finding indicates a reduced rate of ITN utilization compared to the results of the study carried out in the Alamata District of the Tigray region, which reported a utilization rate of (69%) (10). This could be attributed to the variability in the esidence area, the disparities in socio-demographic traits, beliefs, and other cultural distinctions among the regions of the participants.

The level of the utilization observed is comparatively lower than that recorded in studies carried out in other malaria-endemic nations, including the Democratic Republic of Congo, where it reached 71.4% (66), and Mozambique (68.4%) (67). But it is also greater than studies carried out in other countries like Malawi (53%) (68) and Uganda (35%) (34).

The study found that having a mosquito breeding site around a house increases the likelihood of utilization of Insecticide-treated nets (ITN) by 1.78 times. This could be explained by the fact that people exposed to mosquito breeding places have little fear, thus they do not use the ITN. Families with 4 to 6 members had a 42% lower likelihood of using ITN than households with fewer than 4 members, and households with more than 6 members had a 72% lower likelihood of using ITN than households with fewer than 4 members, which could also be attributed to larger household sizes. It may be difficult to offer importance and focus to the pregnant woman. This result is similar to the study carried out in Jimma Zone, Limmu Seka district (69), and also in Oromia Region, Mieso woreda (70). On the other hand, pregnant women who don't perceive that using ITN causes a problem had 3.5 times more chance of using ITN than those who say that using ITN causes a problem. This finding is also consistent with a similar study carried out in the Oromia Region, Mieso woreda (70). This is related to the knowledge of the pregnant woman, who assumes the side effects rather than the use of ITN. Pregnant women's who attended

primary education and high school had 1.28 times and 2.19 times more probability of using ITN, respectively than women who did not attend education. This result is nearly consistent with a similar systematic review conducted in Jimma Zone, Limmu Seka District (69). and also, in Oromia Region, Mieso woreda (70) and a nationwide study conducted in Rwanda (62).

The other important finding from this research, which is slightly different from the initial assumption and many other studies, is that pregnant women who were in the 6-to-10-month gestation period had 85% less likelihood of using ITN than those who were in the 1 to 6 month gestation period. The reason behind this could be explained by the fact that during the beginning of gestation, women's attention is given to their health condition as exposure to the failure of the pregnancy is higher, and also because they experience the pregnancy more times, they lose fear and are reluctant to care.

Participants indicated that numerous issues impact the daily usage of insecticide-treated nets, such as their irritation, rapid dirt accumulation, failure to properly kill mosquitos, and inclination to generate heat, which is comparable to the studies carried out Belesa area (54). Participants proposed boosting insecticide-treated net use through awareness creation, follow-ups, empowering health extension workers, and using a one-to-five discussion strategy. They also claimed that people who used insecticide-treated nets (ITNs) for other reasons should be punished.

7. Strengths and limitations of the study

7.1. Strengths

- Including qualitative research helps to investigate the participants' fresh ideas during the study.
- Qualitative sections contribute to a better understanding of the factors that influence the use of insecticide-treated nets (ITNs) among pregnant women.

7.2. Limitations

- ✓ The cross-sectional study design does not provide information regarding the duration of exposure or other associated effects.
- ✓ The study was conducted in a single community, which may limit generalizability.

8. Conclusion and Recommendation

8.1. Conclusion

A significant portion of the pregnant women participating in this study, nearly fifty percent, did not make use of insecticide-treated nets (ITNs). This figure falls short of the target established by the Ministry of Health regarding ITN usage among at-risk populations. Living around mosquito breeding sites, education status perception of presence problems while using ITN, and gestation period were factors significantly linked to the utilization of ITNs.

8.2. Recommendation

- ➢ A stronger awareness-creation system should be employed by concerned governmental non-governmental organizations before and after the distribution of insecticide-treated nets (ITNs).
- ➢ Health sectors should carry out follow-up actions after the distribution of nets to ensure that they are not utilized for purposes other than intended.
- ➢ The woreda should also work to strengthen community leaders to influence the women for proper utilization of the nets in the area.
- ➢ The Ethiopian government should prioritize educating pregnant mothers and implementing multimedia effects to raise awareness of insecticide-treated nets (ITNs) usage.
- ➢ Misconceptions about insecticide-treated nets and malaria need to be addressed through extensive information dissemination, educational programs, and behavioral change.

References

1. World malaria report 2022 World malaria report 2022. 2022.

2. Schantz-Dunn J, Nour NM. Malaria and pregnancy: a global health perspective. Rev Obstet Gynecol [Internet]. 2009;2(3):186–92. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19826576%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC2760896

3. NMCP; Ministry of Health and Sports. National strategic plan: Intensifying malaria control and accelerating progress towards malaria elimination (2016-2020). 2016;57. Available from: http://origin.searo.who.int/myanmar/documents/malarianationalstrategicplan2016-2020.pdf

4. Diema Konlan K, Amu H, Konlan KD, Japiong M. Awareness and Malaria Prevention Practices in a Rural Community in the Ho Municipality, Ghana. Pani SP, editor. Interdiscip Perspect Infect Dis [Internet]. 2019;2019:9365823. Available from: https://doi.org/10.1155/2019/9365823

5. Konlan KD, Japiong M, Konlan KD, Afaya A, Salia SM, Kombat JM. Utilization of Insecticide Treated Bed Nets (ITNs) among Caregivers of Children under Five Years in the Ho Municipality. Interdiscip Perspect Infect Dis. 2019;2019.

6. Mbchb IP, Mbbs Mph I V, Mbbs EO, Mph M, Bm A, Msc M. The effect of insecticide treated bed net use on malaria episodes, parasitaemia and haemoglobin concentration among primigravidae in a peri-urban settlement in southeast Nigeria. J Rural Trop Public Heal. 2007;6:24–32.

7. WHO. Word Malaria Report 2021 [Internet]. Word Malaria report Geneva: World Health Organization. (2021). Licence: CC BY-NC-SA 3.0 IGO. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

8. Bhatt S, Weiss DJ, Cameron E, Bisanzio D, Mappin B, Dalrymple U. Europe PMC Funders Group The effect of malaria control on Plasmodium falciparum in Africa between 2000 and 2015. 2016;526(7572):207–11.

9. Gamble C, Ekwaru PJ, Garner P, Ter Kuil FO. Insecticide-treated nets for the prevention of malaria in pregnancy: A systematic review of randomised controlled trials. PLoS Med. 2007;4(3):506–15.

10. Desta Araya G. Utilization of Long Lasting Insecticidal Nets Among Household in Malarious Areas of Raya Alamata District, Tigray, Ethiopia. Sci J Public Heal. 2015;3(2):216.

11. Tariku MK, Dagnew Z, Misikir SW, Belete AH. Utilization of Long-Lasting Insecticide Treated Net and Associated Factors Among Pregnant Women in Malarious Kebeles in Awabel District, North-West Ethiopia, 2017 [Internet]. Research Square; 2020. Available from: http://europepmc.org/abstract/PPR/PPR159712

12. Angesom T, Gebreyesus H, Gebremariam B. Long-Lasting Insecticidal Net Utilization and Associated Factors Among Pregnant Women in Asgede Tsimbla District, Northern Ethiopia, 2017. Environ Health Insights. 2020;14.

13. Shonga AA, Boltena MT, Boltana TF, Sciences H. Insecticide Treated Bed Nets Utilization among

Pregnant Mothers and Associated Factors in Damot Pulasa District , Southern. J Heal Med Nurs [Internet]. 2018;46:224–30. Available from: https://pdfs.semanticscholar.org/a957/2480c25d693b39f7a7e3e9e703c6a88827fb.pdf

14. Admasie A, Zemba A, Paulos W. Insecticide-Treated Nets Utilization and Associated Factors among under-5 Years Old Children in Mirab-Abaya District, Gamo-Gofa Zone, Ethiopia. 2018;6(February):1–7.

15. Yeshaneh A, Adane D. Insecticide Treated Net (ITN) Utilization and Associated Factors among Pregnant Women's in Halaba Kulito Town, South Ethiopia, 2016: Cross-Sectional Study. Int J Infect Dis Ther. 2020;5(2):34.

16. Mahamar A, Andemel N, Swihart B, Sidibe Y, Gaoussou S, Barry A, et al. Malaria Infection Is Common and Associated With Perinatal Mortality and Preterm Delivery Despite Widespread Use of Chemoprevention in Mali : An Observational Study 2010 to 2014. 2021;73(8):1355–61.

17. Kassie GA, Adella GA, Gebrekidan AY, Gebeyehu NA, Gesese MM, Abebe EC. Insecticide-treated bed net utilization and associated factors among pregnant women in Ethifile:///C:/Users/user/Downloads/s12936-016-1541-x.pdfopia : a systematic review and meta-analysis. Malar J [Internet]. 2023;1–17. Available from: https://doi.org/10.1186/s12936-023-04655-7

18. Indicator M. Cover photo: Ashenafi Assefa. 2016;

19. Gultie T, Ayele G, Tariku B, Kondale M, Zerdo Z, Merdekiyos B, et al. Trend of declining bed net utilization among pregnant women in Ethiopia : new data from the Arba Minch Health and Demographic Surveillance System , 2010 – 2016. Malar J [Internet]. 2020;1–5. Available from: https://doi.org/10.1186/s12936-020-03211-x

20. Hulbareg Woreda Health Office Malaria 2022 Report.

21. Belay M, Deressa W. Use of insecticide treated nets by pregnant women and associated factors in a pre-dominantly rural population in northern Ethiopia. 2008;13(10):1303–13.

22. Study ER. Health sector transformation plan-i (hstp-i): 2015/16-2019/20. 2022;(December).

23. Ethiopia Ministry of Health. National Malaria Elimination Roadmap: 2017-2030. 2021;(February):44.

24. Fuge TG, Ayanto SY, Gurmamo FL. Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashogo District, Southern Ethiopia. Malar J [Internet]. 2015;14(1):1–9. Available from: http://dx.doi.org/10.1186/s12936-015-0755-7

25. Gobena T, Berhane Y, Worku A. Low long-lasting insecticide nets (LLINs) use among household members for protection against mosquito bite in kersa , Eastern Ethiopia. BMC Public Health [Internet]. 2012;12(1):1. Available from: BMC Public Health

26. Bauserman M, Conroy AL, North K, Bose C, Meshnick S, Hill C, et al. HHS Public Access. 2021;43(5):282–90.

27. Kagu MB, Kawuwa MB, Gadzama GB. Anaemia in pregnancy: A cross-sectional study of pregnant

women in a Sahelian tertiary hospital in Northeastern Nigeria. J Obstet Gynaecol (Lahore) [Internet]. 2007 Jan 1;27(7):676–9. Available from: https://doi.org/10.1080/01443610701612144

28. Adam I, Khamis AH, Elbashir MI. Prevalence and risk factors for Plasmodium falciparum malaria in pregnant women of eastern Sudan. 2005;4:4–7.

29. Cisse M, Sangare I, Lougue G, Bamba S, Bayane D, Guiguemde RT. Prevalence and risk factors for Plasmodium falciparum malaria in pregnant women attending antenatal clinic in Bobo-Dioulasso (Burkina Faso). 2014;1–7.

30. Boudová S, Divala T, Mawindo P, Cohee L, Phiri LK, Thesing P, et al. The prevalence of malaria at first antenatal visit in Blantyre , Malawi declined following a universal bed net campaign. Malar J. 2015;1–6.

31. Lencha B. Insecticide Treated Net Utilization among Under- Five Children and Household Net Ownership in Adami Tullu District , Oromia Regional State , Ethiopia : a Community Based Cross-sectional study. 2018;26(2):38–44.

32. Ababa A. Ethiopia malaria elimination strategic plan: 2021-2025. 2021;(August 2020):2021–5.

33. Institution/organization. World malaria report 2019 [Internet]. WHO Regional Office for Africa. 2019. xxxix, 185 p. Available from: https://www.who.int/news-room/fact-sheets/detail/malaria

34. Obol JH, Ononge S, Orach CG. Utilisation of insecticide treated nets among pregnant women in Gulu: A post conflict district in northern Uganda. Afr Health Sci. 2013;13(4):962–9.

35. Mbengue MAS, Bei AK, Mboup A, Ahouidi A, Sarr M, Mboup S, et al. Factors influencing the use of malaria prevention strategies by women in Senegal: A cross-sectional study. Malar J. 2017;16(1):1–9.

36. Taremwa IM, Ashaba S, Adrama HO, Ayebazibwe C, Omoding D, Kemeza I, et al. Knowledge, attitude and behaviour towards the use of insecticide treated mosquito nets among pregnant women and children in rural Southwestern Uganda. BMC Public Health. 2017;17(1):4–11.

37. Yitayew AE, Enyew HD, Goshu YA. Utilization and Associated Factors of Insecticide Treated Bed Net among Pregnant Women Attending Antenatal Clinic of Addis Zemen Hospital, North-Western Ethiopia: An Institutional Based Study. Malar Res Treat. 2018;2018.

38. Wedam E, Id K, Awoonor-williams JK, Phillips JF, Kachur SP, Achana SF, et al. Socio-economic and demographic disparities in ownership and use of insecticide-treated bed nets for preventing malaria among rural reproductive-aged women in northern Ghana. 2019;1–13.

39. Berkessa T, Oljira D, Tesfa B. Insecticide treated nets use and its determinants among settlers of Southwest. BMC Public Health [Internet]. 2016;1–8. Available from: http://dx.doi.org/10.1186/s12889-016-2768-8

40. FMOH. National Strategic Plan for Malaria Prevention Control and Elimination in Ethiopia 2011-2015. 2010;2015(August 2010):76. Available from: http://www.nationalplanningcycles.org/sites/default/files/country_docs/Ethiopia/ethiopia_malaria_national_strategic_plan_2011-2015_130810.pdf

41. Organisation WH. World malaria report 2021 [Internet] [Internet]. World Health Organization. 2021. 2013–2015 p. Available from: https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2021

42. FMOH. National Malaria Guidelines, Fourth edition. Natl Malar Giuideline. 2017;3rd(November):1–108.

43. Taffese HS, Hemming-Schroeder E, Koepfli C, Tesfaye G, Lee MC, Kazura J, et al. Malaria epidemiology and interventions in Ethiopia from 2001 to 2016. Infect Dis Poverty. 2018;7(1):1–9.

44. Astatkie A, Feleke A. Utilization of insecticide treated nets in Arbaminch Town and the malarious villages of Arbaminch Zuria District, southern Ethiopia. Ethiop J Heal Dev. 2010;24(1):15–24.

45. World malaria report 2018. 2018.

46. Chanda E, Kamuliwo M, Steketee RW, Macdonald MB, Babaniyi O, Mukonka VM. An Overview of the Malaria Control Programme in Zambia. ISRN Prev Med. 2013;2013:1–8.

47. Study C sectional, Yeshaneh A, Adane D. Insecticide Treated Net (ITN) Utilization and Associated Factors among Pregnant Women ' s in Halaba Kulito Town ,. 2020;5(2):34–40.

48. Yassin IM, Rosnah S, Osman M. Factors influencing the usage of insecticide treated mosquito nets among pregnant women. Int J Heal Res. 2010;3(3):139–44.

49. Njumkeng C, Apinjoh TO, Anchang-kimbi JK, Amin ET, Tanue EA, Njua-yafi C, et al. Coverage and usage of insecticide treated nets (ITNs) within households : associated factors and effect on the prevalance of malaria parasitemia in the Mount Cameroon area. 2019;1–11.

50. Areas R, Zone G, Molla E, Ayele B. Journal of Bacteriology and Parasitology Prevalence of Malaria and Associated Factors in Dilla Town and the Surrounding. 2015;6(5).

51. Woyessa A, Deressa W, Ali A, Lindtjørn B. Malaria risk factors in Butajira area , south-central Ethiopia : a multilevel analysis. 2013;1–10.

52. Nega D, Dana D, Tefera T, Eshetu T. Anemia associated with asymptomatic malaria among pregnant women in the rural surroundings of Arba Minch Town, South Ethiopia. BMC Res Notes. 2015;8(1):4–9.

53. Lencha B, Deressa W. Insecticide treated net utilization and its barriers among under-five children in Adami Tulu district, Oromia Regional State, Ethiopia: A qualitative study. Glob J Med Res. 2015;15(5):0–6.

54. Yirsaw AN, Gebremariam RB, Getnet WA, Mihret MS. Insecticide-treated net utilization and associated factors among pregnant women and under-five children in East Belessa District, Northwest Ethiopia: using the Health Belief model. Malar J. 2021;20(1).

55. Ayele DG, Zewotir TT, Mwambi HG. International Journal of Medicine The risk factor indicators of malaria in Ethiopia. 2013;5(July):335–47.

56. 2016 EFY population Profile (Hulbareg).

57. State OR. FUCULTY OF MEDICINE Assessment of Insecticide Treated Nets (ITNs) Utilization

among Children under five years of age and Pregnant women of Adama Woreda , By Advisor : Dr . Abera Kumie (MD , MSc) Thesis submitted to the School of Graduate Studies of Ad. 2007;(January).

58. Atieli HE, Zhou G, Afrane Y, Lee MC, Mwanzo I, Githeko AK, et al. Insecticide-treated net (ITN) ownership, usage, and malaria transmission in the highlands of western Kenya. Parasites and Vectors [Internet]. 2011;4(1):113. Available from: http://www.parasitesandvectors.com/content/4/1/113

59. Eshetu B, Bekele H, Debella A, Eyeberu A, Balis B, Habte S, et al. Insecticide-treated net utilization and associated factors among pregnant women in Ethiopia: a systematic review and meta-analysis. Front Glob Women's Heal [Internet]. 2023;4(November):1–12. Available from: https://doi.org/10.3389/fgwh.2023.1147583

60. Angesom T, Gebreyesus H, Gebremariam B. Long-Lasting Insecticidal Net Utilization and Associated Factors Among Pregnant Women in Asgede Tsimbla. 2020;

61. Ameyaw EK. Individual, community and societal correlates of insecticide treated net use among pregnant women in sub-Saharan Africa: a multi-level analysis. BMC Public Health. 2021;21(1):1–13.

62. Kawuki J, Donkor E, Gatasi G, Nuwabaine L. Mosquito bed net use and associated factors among pregnant women in Rwanda : a nationwide survey. 2023;9:1–10.

63. OUTBNUCAZ_0.pdf.

64. Nesga D, Abate D, Birhanu G, Addissie A. Assessment of Malaria Vector Control Measures (ITNs & IRS) Utilization and Factors Affecting it in Adama District, East Shoa Zone, Oromia Region Ethiopia, 2018. J Fam Med Heal Care. 2020;6(2):46.

65. Tadele G, Samuel A, Adeba E. Replacement of Long Lasting Insecticide Treated Nets in Malarious Kebeles of Gida Ayana District, East Wollega Zone, Ethiopia. Sci Technol Arts Res J. 2014;3(2):162.

66. Inungu JN, Ankiba N, Minelli M, Mumford V, Bolekela D, Mukoso B, et al. Use of insecticide-treated mosquito net among pregnant women and guardians of children under five in the democratic republic of the Congo. Malar Res Treat. 2017;2017.

67. Moon TD, Hayes CB, Blevins M, Lopez ML, Green AF, González-Calvo L, et al. Factors associated with the use of mosquito bed nets: Results from two cross-sectional household surveys in Zambézia Province, Mozambique. Malar J. 2016;15(1):1–10.

68. Mwandama D, Gutman J, Wolkon A, Luka M, Jafali J, Ali D, et al. The use of intermittent preventive treatment in pregnancy and insecticide-treated bed nets for malaria prevention by women of child-bearing age in eight districts in Malawi. Malar J. 2015;14(1):1–10.

69. Hambisa MT, Debela T, Dessie Y, Gobena T. Long lasting insecticidal net use and its associated factors in Limmu Seka District, South West Ethiopia. BMC Public Health. 2018;18(1):1–7.

70. Tesfaye T, Alemu BM, Egata G, Bekele H, Merga BT, Eshetu B, et al. Insecticide-Treated Nets Utilization and Associated Factors Among Pregnant Women in Miesso Woreda, Eastern Ethiopia: Observational Study. Int J Womens Health. 2022;14.

Chapter VX : Other Additional Output Reports

9.1. Weekly epidemiological bulletin of Silte Zone Health Department week52, 2023.

Silte Zone is located in SNNPR in the North-East part of the region. The estimated population of the zone in 2022 is 1,278,340 with an area of 3,047.83 square Km (2.75% of the regional area). It shares regional boundary with Gurage zone in the north and west, with Halaba especial District in the south, with Hadiya zone in the south-west and shares national border with Oromia region in the east. Siltie zone is composed of 10 administrative woredas and 5 administration town. There are 18 urban and 184 rural administrative and 78% of the population lives in rural areas.

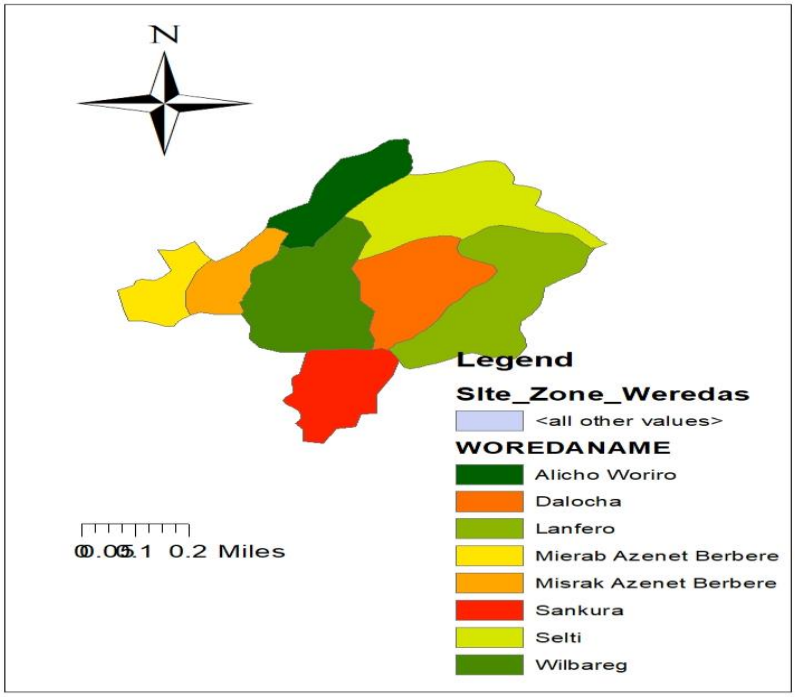

Figure 41: Map of Silte Zone, SNNPR-Ethiopia, 2023.

Epidemiologic Week 52, 2022, Werabe ; Tele 0467710100

Highlights of the week

Surveillance Completeness & Timeliness Rate: Zonally, the proportion of weredas that reported surveillance data was 100 %, which is above the minimum requirement (90%).

Severe Acute Malnutrition: A total of 60 cases with no deaths were reported with increment of 3.4% (2 cases) as compared to last week.

Measles: A total of 1 measles cases were reported from different weredas.

Meningitis: A total of 11 suspected meningitis case without death was reported.

Maternal Death: No maternal deaths and perinatal death were reported.

Introduction

This Epidemiological Bulletin serves to provide key information on public health emergency management activities, and summarizes surveillance data and performance on epidemic prone diseases and other public health emergencies. The bulletin mainly includes surveillance data of week 52 of 2022 and daily phone communication. It highlights the surveillance completeness and timeliness across the Weredas, trends of diseases under surveillance, cluster of cases and events, on-going outbreaks and responses undertaken at all levels in Zone and different activities. The numbers of disease specific cases indicated in this issue of bulletin are subject to change due to on-going receiving late weekly surveillance data and retrospective verification of data from outbreak areas.

Weekly Report completeness and timeliness

In the 1st epidemiological week of 2023, the ZHD received weekly PHEM reports from 10 woreda, 5 town administration and worabe comprehensive specialized hospital. Out of expected woread, 10 and 5 town administration submitted PHEM report on the week with timelines completes of 100% which is above minimum target 95%)

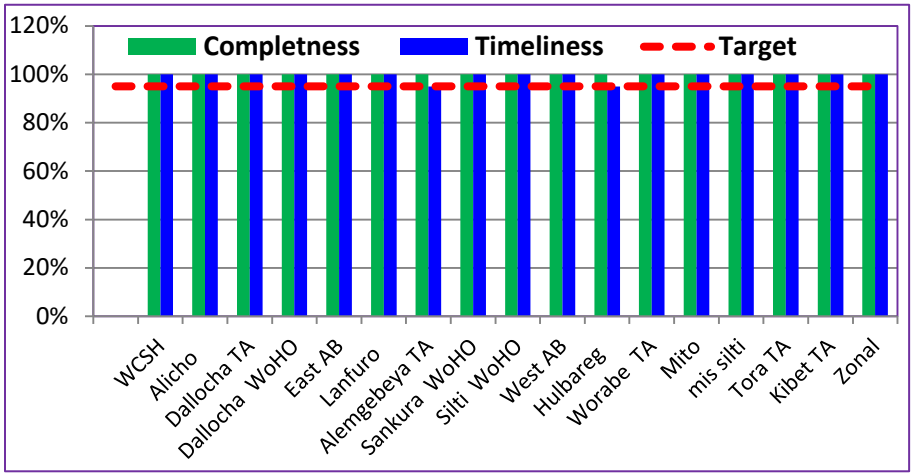

Figure 42: Weekly PHEM report completeness & timeliness by Woreda, week 52 February 2023 G.C

As it is displayed in figure 2, all woreda achevied above target of the zone. In general, majority of Zones achieved above the expected completeness. We recommend maintaining this achievement.

Malaria

In this week, a total of 1,230 suspected malaria cases were examined by RDT/microscopy and 1,230 cases were reported as confirmed malaria Of which Falciparum cases were 780 (63.4%) and P.vivax cases were 450 (36.6%). Overall, a total of 1,230 confirmed cases of malaria were reported in the zone. All treated as outpatient.

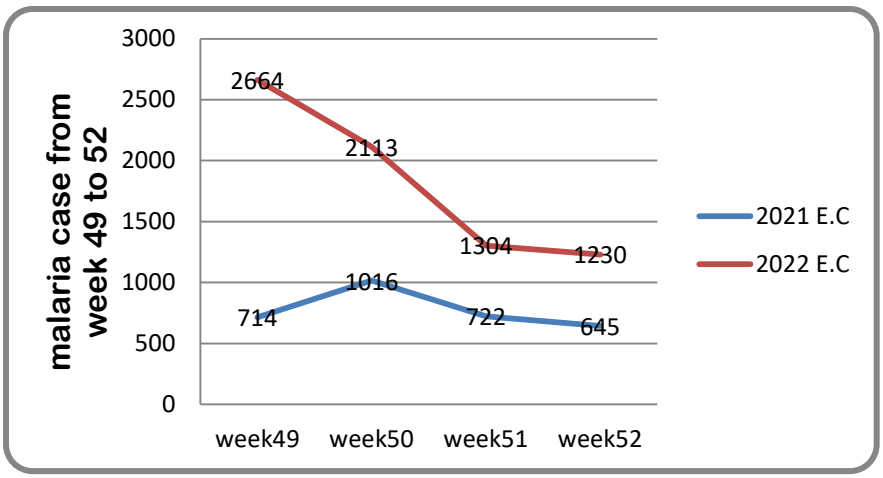

Figure 43: Trends of zonal malaria cas by WHO week, silte, 2021-2022 February 2023 G.C

Among woredas, dallocha town,Worabe town administration, reported the highest malaria case in the week with 333 & 217 cases respectively. Dallocha town, worabe town admin, West Azernet Berbera Woreda, Alemgebya town administration and hulbareg woreda are among top five woredas in the last 52 weeks (See fig 4).

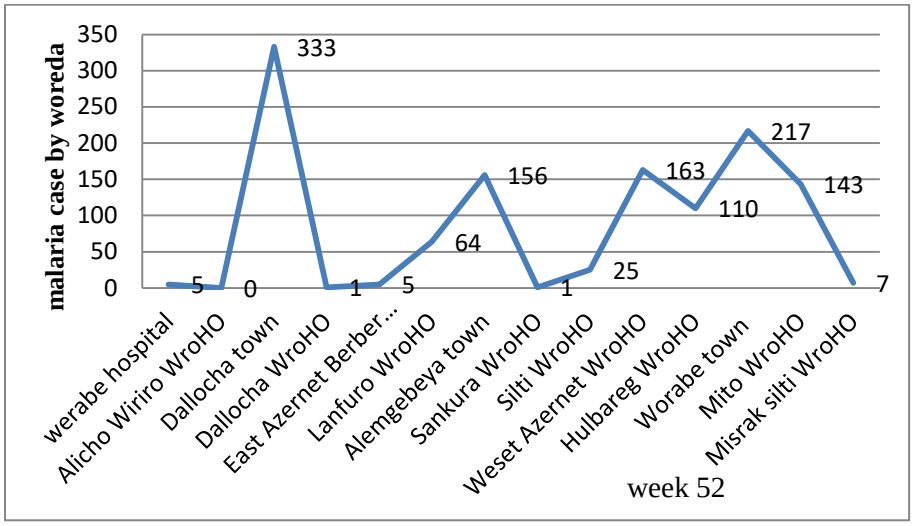

Figure 44: trend of malaria epidemiological week 52 by woreda silte zoneSNNPR-Ethiopia feburwary 2023 G.C

In the last one month, Dallocha town reported the highest malaria case in the zone with 1068 cases. Mito and Dallocha Woreda reported the second and third highest malaria case with 747 and 696 cases.

Table 39: Top 5 woredas with highest malaria case in last one month, SNNPR, week 52,2022.

SN	Name of woreda	Wk49	Wk50	Wk51	Wk52	Total
1	Dallocha town	392	231	112	333	1068
2	Dallocha woreda	316	249	130	1	696
3	Mito woreda	230	251	123	143	747
4	Worabe town	166	145	100	217	628
5	Silti woreda	263	186	138	25	612

Dysentery

During the week, a total of 95 dysentery cases without death were reported showing 39.7% (27 cases) increment as compared to last week. The number of cases reported during the week is higher than the number of cases reported during the same week of the 2022.

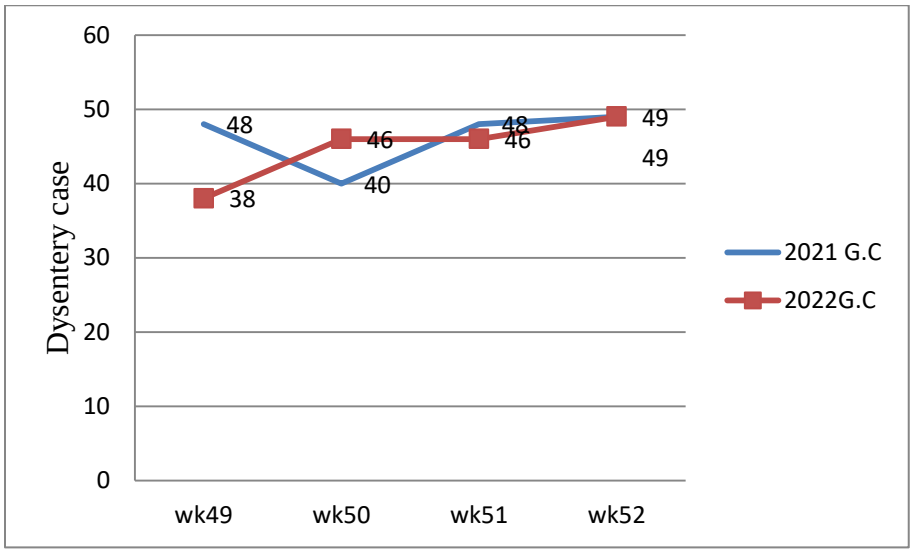

Figure 45: Dysentery cases trend by week, 2021-2022 Ethiopia

The 2 Slti's(west and east slti weredas) reported highest number of cases (27 cases) followed by Lanfuro wereda (19 cases) and Sankura Wereda (13 cases) during the week.

Typhoid Fever

During the week, a total of 432 cases of typhoid fever without death were reported which was 19.3%(70 cases) greater than the last week. The typhoid fever cases reported during the week is higher than the number of cases reported during the same week of the last year. i.e. It

had been increased by 11% (171 cases) in week 52 of 2022 G.C compared with the same week of 2022 G.C (from 432 in week 52 of 2021 to 362 in week 52)cases.

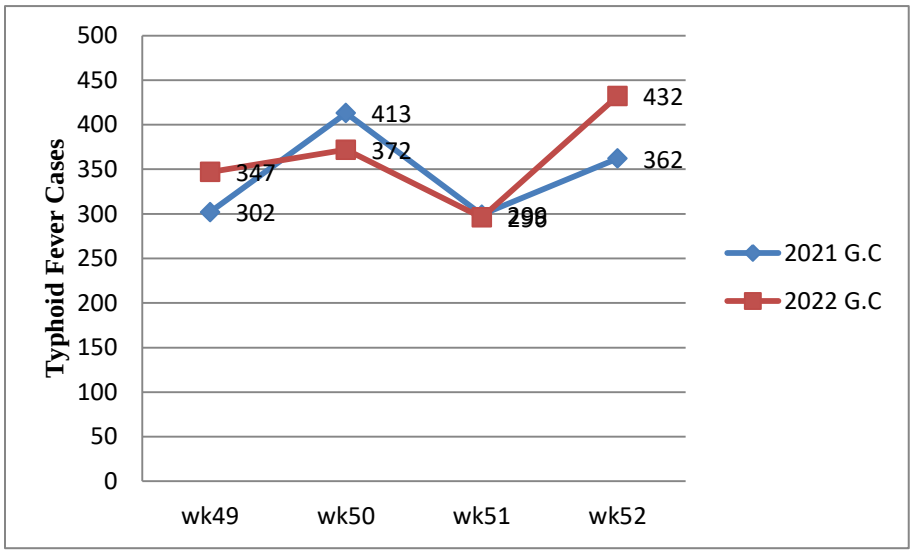

Figure 46: Trends of zonal typhoid fever cases by WHO week 49-week52 Silte2021-2022 G.C February 2023

In week 52, among 432 total typhoid fever cases the highest number of cases were reported from Alicho 168(38.9%) followed by Silti woreda 89 20.7%).

Epidemic Typhus

A total of 327 cases of epidemic typhus without death were reported during the week, which was 0.6% (2 cases) higer than the last week. The number of cases reported during 2022 were higer than the number of cases reported during the same weeks of the last year.

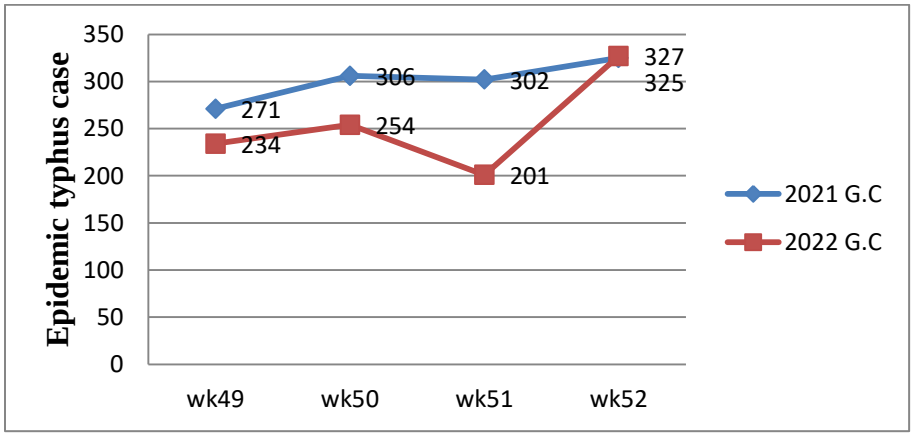

Figure 47: Epidemic typhus cases trend by week49-week52 Silte Zone , 2021-2022 G.C

Alicho wereda reported highest number of cases (63 cases) followed by Dallocha town (61 cases) and Silti wereda (52 cases).

Severe Acute Malnutrition (SAM)

A total of 60 severe acute malnutrition cases were reported in the Zone. Of these 43 were outpatient and 17 were inpatient cases no deaths during the week.

In general, the number of severe acute malnutrition cases is increased by 2 compared to week last year of the same week.

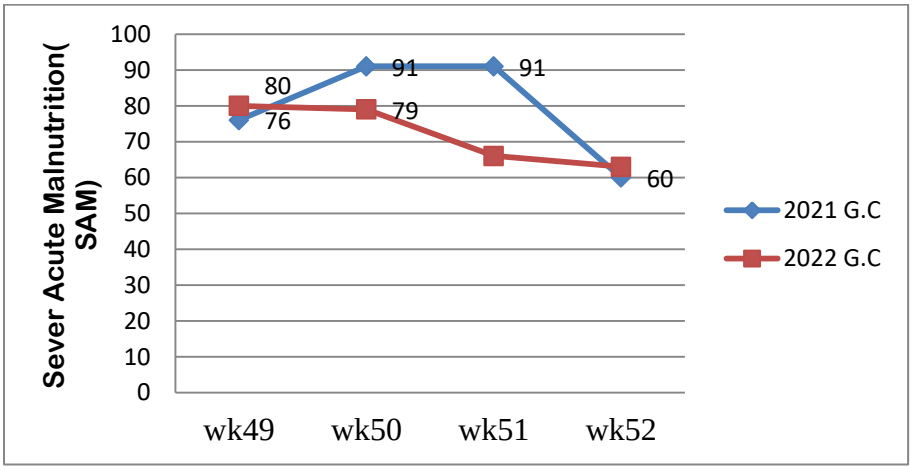

Figure 48: trends of zonal SAM cases by WHO week, Silte, 2021-2022.

At Woreda level the top five new SAM case reported Woredas were Silti Woreda, Dallocha Woreda, Hulbareg Woreda , Worabe Woreda and Sankura Woreda.

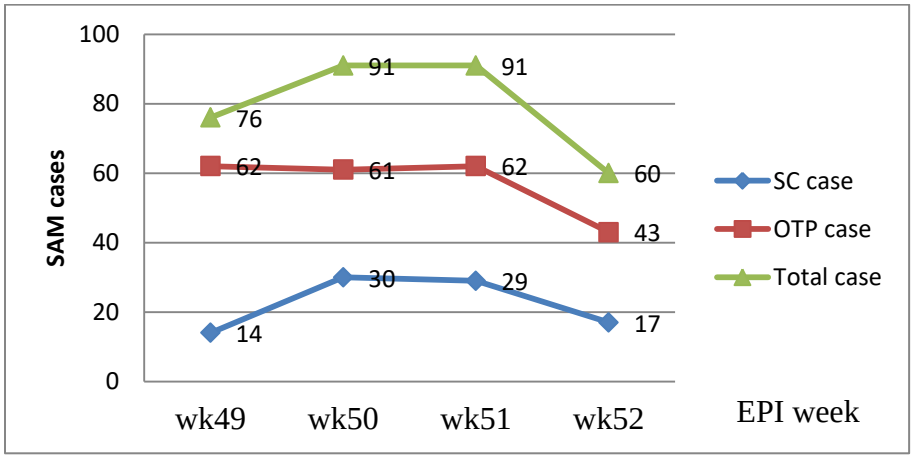

Figure 49: Trends of zonal OTP and SC, Silte WHO Week 49-52 February 2022.

Scabies

During the week a total 146 cases were reported which is 52.7% (128 cases) lower than the last week. Sankura Wereda (17 cases) reported highest number of cases followed by Alicho wereda (14 cases) and dallocha wereda town (12 cases).

Table 40:Distribution of Scabies Case by Weredas from Wk49-52, 2021-2022.

Name of Reporting Wereda	Number of Cases by week				
	Wk 49	Wk50	Wk51	Wk52	Total
Werabe hospital	3	0	0	0	3
Alicho wereda	3	1	2	2	8
Dallocha wereda	0	0	0	12	12
EAB wereda	0	7		0	7
Lanfuro WoHO	0	0	0	14	14
Alemgebeya town	0	0	3	0	3
Sankura Wereda	7	8	0	2	17
Silti WoHO	0	0	0	0	0
WAB wereda	2	1	0	0	3
kibet town	3	0	3		6
Zone Total	18	17	8	30	73

Suspected Measles

In the week, 1 suspected measles cases were reported. The cases were from Worabe hospital.

AFP/Polio

In this week there is no AFP case reported in the zone.

Meningitis

week 11 suspected meningitis cases with zero death were reported in the zone. The cases were reported from werabe Comprehensive specialized hospital

Rabies Exposure

- ✓ In this week there is no rabies case reported in the zone.

Relapsing fever

- ✓ There was no suspected relapsing fever case reported from all woredas from week week 49-52 of 2022.

NNT

- ✓ In this week, no case of NNT reported in the zone.

AWDA

- ✓ There was no AWD cases for the last one days in the region.

MPSDR

- ✓ In this week, there were one perinatal deaths and one maternal death reported in the zone from Werabe CSH.
- ✓ No case or death of Anthrax, yellow fever, AHI, SARS, Pandemic influenza, Viral Haemorrhagic Fever, AWD,Guinea worm, Smallpox and Rabies case was reported in the zone in this reporting period.
- ✓ No case or death of Anthrax, yellow fever, AHI, SARS, Pandemic influenza, Viral Haemorrhagic Fever, Guinea worm, Smallpox, and Rabies reported in the Zone in this reporting period.

Recommendation

- ➢ The overall completeness and timeliness rate of the zone is good and needs to be maintained.
- ➢ Typhoid and typhus case increased week to week hygiene and sanitation should be improved.
- ➢ Malaria and malnutrition prevention and control activities needs strengthening as cases have increased week to week.
- ➢ Improve over all disease surveillance and early response activities
- ➢ Strength collaboration and coordination with stakeholders.

Acknowledgement

- ➢ Silte Zone Public Health Emergency Management Department members
- ➢ AAU-CHS field epidemiology coordinator, academic and field advisor.

Annexes

Questioners for Evaluation of the Malaria Surveillance System

CASE DETECTION AND REGISTRATION (Observation)

Is there a clinical register in health facilities? Yes/No_____

Do health facilities correctly registered cases? Yes/No_____(Observe the last 30 days)

Is there a standardized case definition for the country's priority diseases in health facilities? Yes/No_____

DATA REPORTING

Is there appropriate surveillance forms for that site at all times over the past 6 months? Yes/No_____

Does report and register have consistency? Yes/No_____ Observed that the last monthly report agreed with the register for 4 diseases (1 for each targeted group [eradication; elimination; epidemic prone; major public health importance])

a. Obs. Measles Y / N b. Obs. Malaria Y / N

c. Obs.AFP (polio) Y / N d. Obs. AWD Y / N

Number of reports in the last 6months compared to expected number Obs. Weekly: /24 times the number of sites Obs. immediately: /-- times the number of sites

On time (use national deadlines) Obs. Number of weekly reports submitted on time:- _____ /24 times the number of sites Obs. Number of immediately reports submitted on time: ___/-- times the number of sites

Means for reporting in health facilities/health office to next level

a. Mail b. Fax c. Telephone d. Radio e. Electronic f. Other

How can reporting be improved? _____

III. DATA ANALYSIS

Described data by person (outbreaks, sentinel) Obs. Observed description of data by age and sex Yes No

Described data by place Obs. Observed description of data by place (locality, village, work site etc) Yes No

Described data by time Obs. Observed description of data by time Yes No

Performed trend analysis Obs. Observed line graph of cases by time Yes No

IV. Epidemic response

Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease? Yes No

V. Feedback

How many feedback bulletin or reports has the health facility received in the last year? Obs. Observed at least 1 report or bulletin at the health facility from a higher level during the past year on the data they have provided Yes No

How many meetings has this health facility conducted with the community members in the past six months? _____

Obs. Observed the minutes or report of at least 1 meeting between the health facility team and the community members within the six months Yes No

VI. Supervision:

How many times have you been supervised in the last 6 months?_____ Obs. Observed supervision report or any evidence of supervision in last 6 months Yes No

Was supervision intended for surveillance activities? Obs. Observed supervision report or any evidence for appropriate review of surveillance practices Yes No

VII. Training

Have you been trained in disease surveillance and epidemic management? Yes No

If yes, specify when, where, how long, by whom?_____ VIII. Resources Health facilities that have:

Logistics a. Electricity b. Solar/Generator c. Bicycles d. Motor cycles e. Vehicles

Data management a. Stationery b. Computer c. Software d. Printer

Communications a. Telephone service b. Fax c. Computers

Information education and communication materials a. Posters b. Megaphone c. Generator d. Screen e. Other:

Hygiene and sanitation materials a. Spray pumps b. Disinfectant

Protection materials (list) _____ _____ _____

The main gaps identified in the surveillance system and how to improve_____

SURVEILLANCE SYSTEM EVALUATION QUESTIONNAIRE Date of Interview: ----------Region ----------Woreda----------Interviewer: ---------- Interviewee: ----------Responsibility: ----------

DISTRICT (WOREDA LEVEL) QUESTIONNAIRE

Availability of national surveillance manual

1. Is there national guideline for Malaria and PHEM at this site?

1. Yes 2. No 3.unknown 4.Not Applicable

2. Does the district have line list, epidemic reporting form, and rumor log book?

1. Yes 2.No 3.Unknown 4.Not applicable

II. Data reporting:

Have you lacked of forms recommended for the country at any time during the last 6 months? 1. Yes 2.No 3.Unknown

Number of reports received in the last 3 months compared to expected number Weekly: _____ /12 times the number of health facilities Immediately: _____/----- times the number of health facilities On time (use national deadlines)

Number of weekly reports submitted on time: ____/12 times the number of health facilities

Number of immediately reports submitted on time: _____/3 times the number of health facilities

How do you report (Multiple answers are possible): 1. Mail 2. Telephone 3. Fax 4. Electronic 5. Radio 6. Others (specify)……..

How can reporting be improved?

_____

_____ _____

Percent of sites that: Describe data by person, time and place (case based, outbreaks, and sentinel) 1. Yes 2.No 3.Unknown 4.Not applicable

Do you have an action threshold for any of the country priority diseases? 1. Yes 2.No 3.Unknown 4. Not applicable

If yes, what is it? _____cases _____% increase _____rate

_____ _____

Do you have appropriate denominators? Observe presence of demographic data at site (E.g. population <5 yr, population by village,)

1. Yes 2.No 3.Unknown 4.Not applicable

Who is responsible for data analysis? _____

How often do you analyze the collected data?

1. Daily 3. Every 2 weeks 2. Weekly 4.Monthly

5. Quarterly 6. As needed

Outbreak investigation:

1. Number of outbreaks suspected in the past 6months:_____

2. Observe: Of those, number investigated (Observe reports and take copies if possible): _____

3. Has your district ever investigated an outbreak?

1. Yes 2.No 3.Unknown 4.Not applicable

4. Existence of epidemic preparedness and response plan at district level 1. Yes 2.No 3.Unknown 4.Not applicable

5. Do the districts have written plan of epidemic preparedness and response 1. Yes 2.No 3.Unknown 4.Not applicable

6. Has the district had emergency stocks of drugs and supplies at all times in past 1 year?

1. Yes 2.No 3.Unknown 4.Not applicable

7. Has the district experienced shortage of drugs, vaccines or supplies during the most recent epidemic (or outbreak)?

1. Yes 2.No 3.Unknown 4. Not applicable

Is there budget line or access to funds for epidemic response?

1. Yes 2.No 3.Unknown 4.Not applicable

Percent of districts that have an epidemic management committee Observation: Observe minutes (or reports) of meetings of epidemic management committee

1. Yes 2.No 3.Unknown 4.Not applicable

Does the district have rapid response team for epidemics?

1. Yes 2. No 3.Unknown 4. Not applicable

Responses

1. Has the district implemented prevention and control measures based on local data for at least one reportable disease or syndrome? 1. Yes 2.No 3.Unknown 4.Not applicable

2. Does the district responded within 48 hours of notification of most recently reported outbreak (from written reports)

1. Yes 2.No 3.Unknown 4.Not applicable

3. Has epidemic management committee evaluated their preparedness and response activities during the past year? (Observe written report to confirm)

1. Yes 2.No 3.Unknown 4.Not applicable

Feedback:

1. Is there written feedback reports has the district produced in the last year? 1. Yes 2.No 3.Unknown 4.Not applicable

2. How many feedback bulletin or reports has the district received in the last year? _____

3. Supervision_____

4. How many times have you been supervised in the last 6 months?

5. How many supervisory visits have you made in the last 6 months? _____ (Obtain required number of visits from central level)_____

6. the most usual reasons for not making all required supervisory visits. Reason 1_____ Training _____

7. Percent of health personnel (in position of responsibility) trained in disease surveillance

8. Have you been trained in disease surveillance? 1. Yes2.No 3.Unknown 4.Not applicable

9. If yes, specify when, where, how long, by whom?

_____

10 .What percent of your personnel in the district have been trained in surveillance and epidemic management? _____

Resources:

Percent of sites that have:

Logistics

1. Electricity 3.Motor cycles 2. Bicycles 4.Vehicles

Data management

1. Stationary 2.Calculator 3.Computer 4.Printer

Communication 1. Telephone service 2. Fax 3. Radio 4. Computers that has modems

Information Education and Communication materials

1. Posters 2. Megaphone 3. Generator 4. Screen 5. Projector (Movie) 6. Others (specify):_____

5. Hygiene and sanitation materials

1. Spray pumps 2.Disinfectant

6. Surveillance coordination:_____

7. Is there a surveillance co-ordination focal point within the district epidemic management committee?

8. Satisfaction with surveillance system_____

9. Are you satisfied with the surveillance system? 1. Yes 2.No 3.Unknown 4.Not applicable

10. If no, how can the surveillance system be improved?

II. HEALTH CENTER QUESTIONNAIRE

Date of interview: ----------Region ----------Woreda----------Interviewer: ---------- Interviewee: ----------Responsibility: ----------Name of Health Center----------

Availability of a national surveillance manual

1. Is there national manual for surveillance at this site?

1. Yes 2.No 3.Unknown 4.Not applicable

Case detection and registration

2. Percent of health facilities that have a clinical register

1. Yes 2.No 3.Unknown 4.Not applicable

3. Percent of health facilities that correctly register cases filling of the clinical register during the previous 30 days 1. Yes 2.No 3.Unknown 4.Not applicable 4. Do you have a standard case definition for: malaria? 1. Yes 2.No 3.Unknown 4.Not applicable Case confirmation

5. Do you have RDT to test Malaria at this facility

1. Yes 2.No 3.Unknown 4.Not applicable

6. Do you have functional microscope to test for Malaria at this facility

1. Yes 2.No 3.Unknown 4.Not applicable

7. Do you have Gemisa reagent to stain plasmodium species?

1. Yes 2.No 3.Unknown 4.Not applicable

8. Do you have oil immersion at this facility?

1. Yes 2.No 3.Unknown 4.Not applicable

9. Have you faced lack appropriate surveillance forms at any time during the last 6 months?

1. Yes 2.No 3. Unknown 4.Not applicable

10. Is the last monthly report agreed with the register for malarial diseases; major public health importance Observation: Malaria 1. Yes 2.No 3.Unknown 4.Not applicable

11. Percent of sites that reported each reporting period to the next higher level during the past 3 months Number of reports in the last 3 months compared to expected number Observe Weekly: /12 times the number of sites Observe immediately: /-- times the number of sites 12. On time (use national deadlines)

Observe: Number of weekly reports submitted on time:-_____ /12 times the number of sites

Observe: Number of immediately reports submitted on time: ___/-- times the number of sites 13. How do you report? 1. Mail 4. Telephone 2. Fax
5. Radio 3. Electronic 6.Other(specify):_____

14.Strengthening reporting How can reporting be improved?

_____ _____

Data analysis

Percent of sites that:

15. Describe data by person ,place and time

16. Do you have an action threshold for any of the Country priority diseases?

1. Yes 2.No 3.Unknown 4.Not applicable

17. If yes, what is it (Ask for malaria diseases)? _____cases ____ % increase _____rate

18. Who is responsible for data analysis? _____

19. How often do you analyze the collected data? 1. Daily 3. Every 2 weeks
4. Monthly 2. Weekly 5. Quarterly 6. As needed……..

20. Do you have appropriate denominators? Observe demographic data at site (E.g. population <5 yr., population by village, total population)

1. Yes 2.No 3.Unknown 4.Not applicable

Epidemic preparedness

21. Is there written case management protocol for malaria epidemic prone disease

1. Yes 2.No 3.Unknown 4.Not applicable

Epidemic response

22. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

1. Yes 2.No 3.Unknown 4.Not applicable Feedback and supervision

23. How many feedback bulletins or reports has the health facility received in the last year? ___

24. How many meetings has this health facility conducted with the community members in the past six months?

25. How many times have you been supervised in the last 6 months?

Training:

26. Have you been trained in disease surveillance and epidemic management?

1. Yes 2.No 3.Unknown 4.Not applicable

27. If yes, specify when, where, how long, by whom?

_____
_____

Resources

Percent of sites that have:

28. Logistics

1. Electricity 3. Motor cycles 2. Vehicles 4.Bicycles

29. Data management 1. Stationery 2. Printer 3. Computer 4.Calculator

30. Communications

1. Telephone 2.service Radio call 3. Fax 4. Computers that have modems

31. Information education and communication materials

1. Posters 2. Megaphone 3. Flipcharts or Image box 4. Projector (Movie 5. Screen 6. Generator 7. Other(Specify):_____

32. Hygiene and sanitation materials 1. Spray pump 2. Disinfectant

33. List protection materials _____
_____

34. Are you satisfied with the surveillance system? 1. Yes 2.No 3.Unknown 4.Not applicable

35. If no, how can the surveillance system be improved?
_____
_____

Date of Interview: ----------Region ---------- Woreda---------- Name of Health Post: ---------- Interviewer: ---------- Interviewee: ----------Responsibility: ----------

Availability of National surveillance Manual

1. Is there national manual for malaria surveillance at this site?

1. Yes 2.No 3.Unknown 4.Not applicable Case detection and registration

2. Is there a clinical register book health facility?

1. Yes 2.No 3.Unknown 4.Not applicable

3. Do you have standard case definition for malaria? 1. Yes 2.No 3.Unknown 4.Not applicable Data reporting 4. Have you faced lack of appropriate surveillance forms at any time during the last 6 months? 1. Yes 2.No 3.Unknown 4.Not applicable 5. Percent of sites that is accurately reported cases from the registry into the summary report to go to higher level? _____

6. Percent of sites that reported each reporting period to the next higher level during the past 3 months Number of reports in the last 3 months compared to expected number Observe Weekly:

Observe Immediately:

7. Percent of HF that have means for reporting to next level by e-mail, telephone, fax or radio? _____

8. How do you report?

1. Mail 2.Fax 3. Telephone 4. Radio 5. Electronic 6.Others(specify):_____

Data analysis

9. Performing trend analysis Observed line graph of cases by time

1. Yes 2.No 3.Unknown 4.Not

Epidemic response

10. Has the health facility implemented prevention and control measures based on local data for at least one epidemic prone disease?

1. Yes 2.No 3.Unknown 4.Not applicable

Feedback and supervision

11. How many feedback bulletins or reports has the health facility received in the last year? __

12. How many meetings has this health facility conducted with the community members in the past six months? _____

13. How many times have you been supervised in the last 6 months? _____

Training

14. Have you been trained in disease surveillance and epidemic management?

1. Yes 2.No 3.Unknown 4.Not

15. If yes, specify when, where, how long, by whom?_____
_____ Resources

Percent of sites that have:

16. Logistics

1. Electricity 3. Motor cycles 2. Bicycles 4.Vehicles

17. Data management 1. Stationery 3.Computer 2. Calculator 4. Printer

18. Communications 1. Telephone service 2.Radio call 3. Fax 4. Computers with modems 19. Information education and communication materials

1. Posters 2. Megaphone 3. Flipcharts or Image box 4.Screen 5.Projector (Movie) 6.Other(specify):_____

20. Hygiene and sanitation materials 1. Spray pump 2. Disinfectant

21. List protection materials _____ _____ _____
_____

Satisfaction with surveillance system

22. Are you satisfied with the surveillance system?

1. Yes 2.No 3.Unknown 4.Not

23. If no, how can the surveillance system be improved?
_____
_____

What opportunities are there for integration of surveillance activities?
_____

Appendix 1:

DATA COLLECTION TOOLS FOR HEALTHE PROFILE ASSESSMENT IN HULBAREG WEREDA, SILTE ZONE, SNNPR, ETHIOPIA, 2023GC.

1. Historical aspects of the Wereda

- Woreda Name_____
- How & why the name given_____
- How and when the woreda was formed_____
- Any other historical aspect about the worda_____
  _____

2. Geography and Climate

Woreda map_____

Location(distance)_____Direction_____ Altitude _____ Surface Area_____(_____% from the zone) Town_____rural _____(land)

Geographical coordinate

- Latitude _____
- Longitude _____
- Annual rain fall(average)_____

- Annual temp(average)_____ - Climatic zones_____ (%) _____ (%) _____ (%)

Wereda boundaries

North _____South_____
East_____Weast_____

3. Political and Administrative Organization

Total no. of kebeles: _____

- rural_____
- Urban_____

4. Population and Population structures

Demographic data

1. Total Population_____Male_____Female_____ sex ratio_____
2. Urban Total _____ Male_____Female_____
3. Rural Total _____ Male_____ Female_____
4. Population under 1yrs_____
5. Population under five yrs_____
6. Population < 15 years_____
7. Population >64 years_____
8. Women 15_49 years of age_____
9. Total population by kebele(each kebele pop)_____
10. Population enumerated by H.E.Ws_____

Population pyramid

Age Group	Male	Female	Total
0-4			
5-9			
10-14			
15-19			
20 24			

25-29			
30-34			
35-39			
40-44			
45-49			
50-54			
55-59			
60-64			
65-69			
70-74			
>74			

Ethnic/language

1) Oromo_____ (_____ %), Amhara_____ (_____ %),
2) Afar_____ (_____ %), Tigre_____ (_____ %),
3) Others_____ (_____ %)

Religion

1. Orthodox _____ (_____ %), Muslim _____ (_____ %),
2. Protestant_____(_____%),
3. Other _____ (_____ %)

5. Economy (mainstay of the economy, average income levels etc)

Main income sources

Agriculture

- Cultivated area_____

- Grazing area_____

- Cropping seasons_____

- Land density_____

- ✓ Livestock
- ✓ Truism
- ✓ Trade
- ✓ Other business

House hold income source

1. Agriculture_____ (#)

2. Government Employer_____(#)

3. Private Employer_____(#)

4. Daily Laborer_____(#)

5. Different business_____ (#)

6. Jobless _____ (#)

7. Average Income_____

6. Education and school Health

Number of educational institution

1. K.G._____

2. Primarily School_____

3. Secondary_____

4. Preparatory_____

5. College/ University_____

6. TVET_____

7. Total School Age Children (target) _____

8. Total Enrolment _____Male_____Female_____

9. School dropout in 6 months or year 2014 _____

10. If there is school dropout why _____

Educational status of the community

1. Total Educated people_____ - Male _____ - Female _____

2. School health activities:

- Number of schools with water supply_____

- Toilets:

- ✓ Schools with functional latrines (male & female)_____
- ✓ Schools with HIV/other Health clubs_____

7. Facilities

Transport

1. Accessibility (main roads)_____
2. Type of road _____
3. How many kebeles have access to transportation _____
4. Flow of transportation per day_____

Telecommunication

1. How many people have access to fixed telephone?_____
2. How many people have access to mobile phone? (coverage)_____

Post Office_____

Bank_____

Power supply

1. How many house hold get power supply_____?

Water

1. Total safe water coverage _____ (___%)
2. Safe water supply coverage by kebele _____
3. Main source of water supply _____
4. Kebeles getting safe water____ (__ %)

5. Population getting safe water_____ (__ %)
6. Daily water consumption per day per person_____

8. Disaster situation in the woreda

1) Was there any disaster (natural or manmade) in the woreda in the last one year? _____
2) Any recent disease outbreak/other public health emergency_____
3) If yes cases_____ and deaths_____

9. Vital Statics and Health Indicators

1. Infant Mortality Rate (IMR) _____(total <1 yr deaths this 2014yr_____)
2. Child Mortality Rate_____(this year's total <15 yr deaths_____)
3. Crude Birth Rate_____
4. Crude Death Rate_____ (total deaths 2014yr____)
5. Maternal Mortality Rate_____(2004 total maternal deaths_____)
6. Contraceptive prevalence rate_____
7. Contraceptive acceptance rate _____
8. ANC rate (how many of the total expected pregnancies attended 1st ANC) _____
9. ANC rate (how many of the total expected pregnancies attended 4th ANC) _____
10. Percentage of deliveries attended by skilled birth attendants_____
11. Percentage of deliveries attended by HEWs_____
12. Percentage of deliveries attended by TBA _____
13. Average family size_____

10. Immunization Coverage (for children and Women)

1. BCG _____ (__ %).
2. OPV0____ (____ %), OPV1_____ (___ %), OPV3_____ (___ %)
3. Penta1_____ (___ %), penta2 _____ (___ %) penta3_____ (___ %)
4. Measles_____ (___ %).
5. PCV-10-1_____(__%), PCV-10-3_____(___%)
6. TT2+P.W_____(__%),TT2+ N.P.W_____(___%)

11. Health Service

Type and Number of Health Institution

Health institution to pop ratio:

- Hospital: Pop----------.
- HC: Pop----------
- HP: Pop----------
- Health service coverage----------

Type and Number of health professionals

S/N	Type		Number	Total type	HW:Pon ratio	Remark
1	Physicians					
2	Health Officers					
3	Nurses	Clinical nurse BSC				
		Clinical nurse Diploma				
		Public health nurse diploma				
4	Midwifery nurses	Midwifery nurse BSC				
		Midwifery nurse diploma				
5	Laboratory	Lab. Technologist				
		Lab. Technician				
6	Pharmacy	Pharmacist				
		Druggist				
7	Biologists					
8	Environmental Health	Environmental health (BSC)				
		Environmental health Diploma				
9	HEWS	Health exstansion worker (Rular)				
		Health Extension worker (Urban)				
10	HMIS					
11	Others Supportive staff (TBA...)					
Total						

12. Top causes of morbidity and mortality in 2014

SN	Types of disease	Number of case	Percent
1			

2			
3			
4			
5			
6			
7			
8			
9			
10			
Total			

13. Health budget allocation

Government

1. Total budget allocated for the woreda _____
2. Total budget allocated for health _____(____%) Funds from
3. NGO 1. Total _____ (purpose/programs)_____

14. Community Health Services

Status of services provided by community health workers namely:

1. No. of TBAs/TTBA_____ and their responsibility _____
2. No. of CHWs/CHPs_____ and their responsibility _____
3. Responsibility of HEWs_____
4. Others_____

15. Status of Primary Health Care Components – with focus on the eight PHC elements and MDG

- MCH (Delivery, ANC, PNC)_____

- FP(Methods) _____
- EPI(outreach service, cold chain, vaccine) : _____

Environmental Health & sanitation.

1. Latrine coverage_____ & utilization rate_____
2. Solid waste management_____
3. Liquid waste management _____
4. others_____

Health Education (what, when, where, how and who conducted health education) _____

16. Endemic diseases

Malaria:

1. Total malariouskebeles_____& Pop at risk_____
2. ITNs coverage (including current dist)_____
3. Is there IRS this year(No of kebeles)_____
4. Total cases/yr_____ deaths/yr_____,<5yr cases_____ deaths_____
5. Malaria supplies (Coartem, RDT, etc) shortage _____
6. Other issues_____

TB/Leprosy:

1. Total TB cases_____
2. PTB negative_____
3. PTB positive_____
4. Extra PTB _____
5. TB detection rate _____
6. TB Rx completion rate _____
7. TB cure rate _____
8. TB Rx success rate _____
9. TB defaulter_____
10. Death on TB Rx_____
11. Total TB patients screened for HIV_____
12. Total Leprosy cases_____on Rx_____

HIV/AIDS

1. Total people screened for HIV (last one year)_____
2. VCT_____ PITC_____PMTCT_____
3. HIV prevalence_____
4. HIV Incidence (new cases/yr)_____
5. Total PLWHA_____
6. On ART_____on Pre-ART_____
7. Other HIV prevention activities_____

Nutrition

1. Total OTP sites_____, total admissions to OTP/yr_____
2. Total SC sites,_____, Newly opened/yr_____, total admissions to SC/yr_____
3. Is there TSF (targeted supplementary feeding) program in the woreda_____
4. CBN program_____ PSNP_____other_____

17. Essential drugs (shortage**)**

_____
_____

. ANNEXES

Annex I. participant information sheet and Letter of informed consent

You are being invited to participate in a research study titled assessment of utilization of insecticide treated net and its associated factor among pregnant women in hulbareg woreda. This study being done by Faris Sulyman from Addis Ababa university.

ELIGIBILITY; to take part in this study, you must pregnant women whom currently living in the area.

Purpose; this study is to assess utilization of insecticide treated net and associated factors among among pregnant Women in Hulbareg woreda, Ethiopia.

PARTICIPATION; your participation in this study is completely voluntary. You may stop or withdraw from the study at any time, or refuse to answer any particular question for any reason without it being held against you. Your decision whether or not to participate will have no effect on your current or future Addis Ababa University. During the study, you will take a self – administered questionnaire asking about your education, demographic questions such as your age and ethnicity and you will also be asked about insecticide treated net utilization and factors influencing its usage and completing this questionnaire will take about 15 minutes.

BENEFITS OF PARTICIPATION; You may not receive any direct benefits from the study however results from this study helps to add knowledge towards Insecticed treated net utilization and factors influencing the usage among pregnant women.

RISKS OF PARTICIPATION; There will be no direct risk or harm by taking part in the study but the risk includes the possibility that you may be offended by some of the questions in the survey but you can skip or stop the survey at any time.

CONFIDENTIALITY; this anonymous survey study is being conducted self-administered questionnaire and in-depth interview. Survey data will be stored only on a password protected computer. All individual answers will be presented in summary form in any papers,

Any information that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. You will not be identified individually in any of the information we get from this study or in any of the research reports/publications. If you agree

to the term and participate in this study you will be asked to complete self-administered questionnaire

By signing below you are indicating that you are at least pregnant, have read and understood this consent form and agree to participate in this research study.

Name of Person: _____

Signature of Person: _____

Date: _____

Study Contact: Faris Sulyman , epidemiology and biostatics school of public health Addis Ababa University

Email; farissulymanmho.12345@gmail.com

Addis Ababa University College of health sciences school of public health

Questionnaire for assessment of utilization of insecticide treated net and its associated factors among pregnant women in Hulbareg Woreda.

Questionnaire identification number----------

Name of health facility----------

Address: kebele---------- sub city----------

Verbal consent form before conducting interview

Greeting

Hello Madam; My name is ----------. I am on the behalf of Addis Ababa University who want to assess the ITNs utilization and associated factors among pregnant women in Hulbareg Woreda. Principal investigator of this study is Mr. Faris Sulyman. You are selected at Systemic sampling to be included under study and there are also another pregnant women selected at Systemic sampling like you. The study is not going to evaluate your personality at all; thus no name and identifier is required and only we use code to each individual. Your private information and identifier will remain confidential.

You have right to refuse to participate, to stop at any part of questionnaire, to jump questions that you are not interested with, and there will be no unwanted effect up on you and your family due to refusal, stopping at any part of interview, or jumping questionswith which you are not interested and there is no reward for the sake of participation.

Therefore, you are kindly requested to tell your real practice regarding ITNs utilization that you experienced and factors affecting its utilization genuinely. Findings from this study are aimed to solve problems regarding ITNs utilization among pregnant women in Hulbareg Woreda. The interview will take nearly up to 40 minutes.

Finally, you can contact the investigator when you have any doubt on cell phone 0963430790 and email address farissulymanmoh.12345@gmail.com.

Consent form

Hello: I understood that the study is going to assess ITNs utilization and associated factors not participant's own personality. I also understood that there will be no punishment due to not participating, stopping, and jumping questions that I am not interested with and no reward for participation. Furthermore, I understood the expected benefits of this study and I have got address of the investigator to contact at the time whenever I have questions and doubt. Therefore, I express my agreement by giving initials of my name: Initials of participant name ---------- -------- Interviewer's name ----------Signature ---------- Date of interview DD/MM/YYYY-------/-------/-------

10.1. Questionnaires, English version

Addis Ababa University College of Medicine and Health Science School of Public Heath

Instructions

1. Permission letter given from the woreda should be always at hand

2. Introduce yourself and purpose of visiting households

3. Ask willingness of respondents

4. Circle number of coding for responses from given alternatives

Identification

Name of kebele……. Questionnaire Identification number…….

Date of visit ……

Interviewer name……Signature……..

A. Socio-demographic characteristics

Q/No	Questions	Coding and responses	Skip
101	Age of the respondent (In complete years)	……..Years	
102	Educational status	1.Illiterate 2. Read and write 3.Grade 1-6 4.Grade 7-12 5.12 and above	
103	Religion	1.chiristian 2.Orthodox 3.Muslim 4.Other specify	
104	Marital status	1.married 2.single 3.divorse 4.widowed 5.separate	
105	What is your occupation?	1.farmer 2.merchant 3.governmental employee 4.house wife 5. Other specify….	
106	Number of Rooms	…….	
107	Bed room condition	1.separated 2. shared with others	
108	Place of residences	1.Rural 2.Semi-urban	
109	Family size	……	
110	What is your ethnicity	1.Silte 2.Wolaita 3.Guragae 4.Other specify…….	

B. Maternal condition.

201	Do you have pregnancy before this	1.first 2.second	

	(number of pregnancy)	3. three and above	
202	Gestational age of current pregnancy	……	
204	Did you have got malaria during your previous pregnancy?	1. Yes 2. No	If No skip 203
205	If Yes types of malaria	1. P.f 2. P.v	
206	Did you got malaria during this pregnancy?	1. Yes 2. No	If No skip 205
207	If Yes which type of malaria?	1.P.f 2. P.v	
208	When pregnant women did uses ITN?	1. Every day 2. As needed 3.When mosquitoes seen 4.Other specify……	
209	Did you attend ANC this pregnancy?	1.Yes 2. No	
210	If Yes how many times?	……	
211	If No why not	……	
212	Did you have ITN?	1. Yes 2. No	
213	If Yes ,from where	……	
214	If No, why not	……	
215	Did the pregnant mother slept under ITN before the study?	1. Yes 2. No	
216	If Yes, how many times	1. Every day 2. When mosquito seen 3.Other specify……	
217	If No, why not?	……	

C. Environmental, Educational and other Factors.

Q/No	Questions	Coding and responses	Skip
301	How do we acquire malaria?	1.By bite of mosquito 2.Bad season 3. Other specify…….	
302	Do you know symptom of malaria?	1.headache 2.fever 3.Other specify……..	
303	Where did you get the information?	1. radio 2.television 3. Heath extension workers 4.Other specify…	
304	How we can prevent malaria infection transmission	1.By using ITN 2.By DDT spraying 3.Drug prophylaxis 4. Other specify	
305	Is there mosquito breeding site around the house?	1. Yes 2. No	
306	If Yes, what would you do?	1.Flowing the water 2 .Disturbing the water 3.Other specify……	
308	Does household own ITN?	1. Yes 2. No	
309	If "Yes" for Qns 308, how many?	1.one 2.two 3. three and above	
310	If NO to Qns 308, what is the major Reason?	1.Lack of information 2.Price is expensive 3.Not available in the area 4. Did not want 5. Other specify…….	
311	Did you have hanging area of ITN	1. Yes 2. No	
312	Who are at high risk of malaria in households	1.Under five children 2.Pregnant women 3. Adults 4.Old age 5. Other, specify…	
313	Who should be given priority in malaria prevention in the household?	1.Under five children 2.Pregnant women 3. Adults 4.Old age 5. other, specify	
314	Did ITN prevents malaria?	1.Yes 2.No	

315	How does ITNs prevent malaria Transmission?	1.Physical barriers 2. Kills mosquito 3.irritate mosquito 4.Not known 5. other, specify……..	
316	How frequent and when should one use ITN?	1.every night 2.when mosquito seen 3. Seasonally 4.Other specify… .	
317	Did pregnant mother uses ITN?	1.Yes 2.No	
318	If Yes, how many times?	1. Every days 2. When mosquitoes seen 3. Other specify……	
319	If NO to 318 above, why not?	1.No mosquito seen in the house 2.Forgotten 3. Did not want 4.Others, specify……..	
320	Did pregnant mother uses ITN?	1.Yes 2.No	
321	Does sleeping under bed net cause any Problem?	1.Yes 2.No	
322	If YES, to 320, what are the major problems?	1.No comfort 2.Cause heat 3. Air hanger 4.other, specify……	
323	Does sleeping under bed net cause any Problem?	1.Yes 2.No	

D .Points for observation during the study (Factors)

Q/No	Points to be observed	Coding and responses	Skip
401	Number of beds for sleeping	1.One 2.Two 3.Three and above	
402	Number of ITN observed in households	1.One 2.Two 3.Three and above	
403	Number of beds /places of sleep observed with bed nets	1.One 2.Two 3.Three and above	
404	Types of ITN used in households	1.re-treatable 2.permanently treated	
405	Is there a place for hanging ITN properly?	1.Yes 2. No	
406	Is bed net hanged sleeping area properly?	1.Yes 2. No 3.Other Specify…….	
407	Is there any hole(throne) in the bed net	1.Yes 2.No	
408	Did the pregnant mother slept under ITN before the study?	1.Yes 2.No	

E. About utilization

409 Did pregnant mother use ITN every day? 1. Yes 2.No

Name of the interviewer/Observer…….

Signature…….....Date……

Name of the supervisor ……..…….

Signature……Date …….

FOCUS GROUP DISCUSSION GUIDE

A. INTRODUCTION

1. Thank you for coming to this session

2. As much as possible we will try to use our time efficiently

3. Introduce yourself and where you come from

B. PURPOSE

1. We will be discussing your reactions towards ITNs use and its determinants factors

2. I am interested in all your ideas, comments and suggestions.

3. All comments, both positive and negative to the point of discussion are welcomed.

5. Please feel free to agree or disagree with one another.

We will record all your comments, so that we could not miss any of your ideas while trying to take notes. And I assure you that all your comments are confidential, used for research purpose only.

I want our session to be a group discussion, so you need not wait for me to call on you. Please speak one at a time, so that the tape-recorder can pick up every your suggestions and comments.

FGD FOR PREGNANT WOMEN

1. Could you tell me to what extent malaria is a problem in your area and its cause?
2. Tell me about the methods of prevention and control against malaria?
3. Could you tell me the general practices towards ITNs use and associated factors in your area?
4. Who is prioritizing group in your area?
5. Why pregnant mother did not use ITN every day?
6. Could you describe the major factors that affect continues ITNs use by pregnant women in your surrounding?
7. What do you suggest to improve for continues use of ITNs by pregnant women?

Before end, I would like to ask each of them if there is anything additional they would like to say about the idea of ITNs use during pregnancy and its determinants.

Thank you so much for coming to this session. Your time is very much appreciated and your insights have been very helpful.

10.2. Questionaries' Amharic version

በአዲስ አበባ ዩኒቨርሲቲ የህክምና እና ጤና ሳይንስ ኮሌጅ የህዝብ ጤና ትምህርት ቤት
መመሪያዎች

1. **ከወረዳው የተሰጠ የፍቃድ ደብዳቤ ሁል ጊዜ በእጅ መሆን አለበት፡፡**
2. **እራስዎን እና ቤተሰብን የመጎብኘት አላማን ያስተዋውቁ**
3. **ምላሽ ሰጪዎችን ፈቃደኛነት ይጠይቁ**
4. **ከተሰጡ አማራጮች ምላሾች የክበብ ቁጥር**

አባሪ I. የተሣታፊ መረጃ ወረቀት እና በመረጃ ላይ የተመሰረተ የስምምነት ደብዳቤ

እርስዎ በሁልባረግ ወረዳ በሉ ነበሰጡር እናቶች በአጎበር አጠቃቀም መካከል ያለውን ተያያዥነት ባለው የምርምር ጥናት ላይ እንዲሳተፉ ተጋብዘዋል፡፡ ይህ ጥናት በአቶ ፋሪስ ሱላይማን ከአዲስ አበባ ዩኒቨርሲቲ እየተካሄደ ነው፡፡

ብቁነት; በዚህ ጥናት ላይ ለመሳተፍ ነብሰጡር የሆኑና በአሁኑ ጊዜ እዛው አካባቢ የሚኖሩ መሆን አለባችሁ፡፡

ዓላማ; ይህ ጥናት በአጎበር አጠቃቀም እና ተያያዥነትን ለመገምገም ነው፡፡

የመሳተፍ አደጋዎች; በጥናቱ ውስጥ በመሳተፍ ምንም አይነት ቀጥተኛ አደጋ ወይም ጉዳት አይኖርም ነገር ግን አደጋው በዳሰሳ ጥናቱ ውስጥ ባሉ አንዳንድ ጥያቄዎች ሊናደዱ እንደሚችሉ ያካትታል ነገር ግን የዳሰሳ ጥናቱን በማንኛውም ጊዜ መዝለል ወይም ማቆም ይችላሉ.

ሚስጥራዊነት; ይህ የማይታወቅ የዳሰሳ ጥናት በራሱ የሚተዳደር መጠይቅ እና ጥልቅ ቃለ መጠይቅ እየተካሄደ ነው፡፡ የዳሰሳ ጥናት መረጃ የሚቀመጠው በይለፍ ቃል በተጠበቀ ኮምፒውተር ላይ ብቻ ነው፡፡ ሁሉም የግል መልሶች በማጠቃለያ ቅጽ በማንኛውም ወረቀቶች ውስጥ ይቀርባሉ ፣

የሰው ስም፡ _____

የሰው ፊርማ፡ _____

ቀን፡- _____

የጥናት ግንኙነት፡ ፋሪስ ሱላይማን፣ የህብረተሰብ ጤና ትምህርት ቤት አዲስ አበባ ዩኒቨርሲቲ

ኢሜል; farissulymanmoh.12345@gmail.com

በአዲስ አበባ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ የህዝብ ጤና ትምህርት ቤት

በሁልባረግ ውስጥ ያሉ ነብሰጡር እናቶች አጎበር አጠቃቀም እና ተያያዥ ምክንያቶችን ለመገምገም መጠይቅ

ጥያቄዎች

መጠይቅ መለያ ቁጥር ----------

የወረዳው ስም ----

አድራሻ፡ ቀበሌ ---------- ክፍለ ከተማ ---

ቃለ መጠይቅ ከማድረግዎ በፊት የቃል ስምምነት ቅጽ

ሰላምታ እመቤት; የኔ ስም ----------. በሁልባራግ ወረዳ ነፍሰ ጡር እናቶች ላይ ያለውን የአጎበር አጠቃቀም እና ተያያዥ ጉዳዮችን ለመገምገም በአድስ አበበ ዩኒቨርሲቲ ተመድቤአለሁኝ። የዚህ ጥናት ዋና መርማሪ አቶ ፋሪስ ሱላይማን ነው። እርስዎ በጥናት ላይ ለመካተት በዘፈቀደ ተመርጠዋል እና እንደ እርስዎ በዘፈቀደ የተመረጡ ሌሎች ነፍሰ ጡር ሴቶችም አሉ። ጥናቱ የእርስዎን ስብዕና በጭራሽ አይገመግምም; ስለዚህ ምንም ስም እና ልዩ መለያ ያስፈልጋል እና እኛ ብቻ ኮድ ለእያንዳንዱ ግለሰብ እንጠቀማለን። የእርስዎ የግል መረጃ እና መለያ ሚስጥራዊ እንደሆኑ ይቆያሉ። ለመሳተፍ አሻፈረኝ የማለት፣ በማንኛውም የመጠይቁ ክፍል ላይ ለማቆም፣ ፍላጎት የማትፈልጉትን ጥያቄዎች ለመዝለል መብት አሎት፣ እና በማንኛውም የቃለ መጠይቅ ክፍል ላይ በማቆም በአንች እና በቤተሰብሽ ላይ ያልተፈለገ ውጤት አይኖርም። ወይም የማትፈልጉትን ጥያቄዎች መዝለል እና ለተሳትፎ ሲባል ምንም ሽልማት የለም። ስለዚህም ያጋጠሙዎትን የአጎበር አጠቃቀም እና አጠቃቀሙን በትክክል የሚነኩ ሁኔታዎችን በሚመለከት ለትክክለኛው ልምድዎ እንዲናገሩ በአክብሮት እንጠይቃለን።

ከዚህ ጥናት የተገኙ ውጤቶች በሁልባራግ ወረዳ በነፍሰ ጡር እናቶች ላይ የሚስተዋሉ ችግሮችን ለመፍታት ያለመ ነው። ቃለ መጠይቁ እስከ 40 ደቂቃ ድረስ ይወስዳል።

በመጨረሻም በሞባይል ስልክ +251963430790 እና በኢሜል አድራሻዎ farissulymanmoh.12345@gmail.com ላይ ጥርጣሬ ሲኖርዎ መርማሪውን ማነጋገር ይችላሉ፡፡

የስምምነት ፎርም

ሰላም፡ ጥናቱ የአጎበር አጠቃቀምን እና የተሳታፊዎችን ስብዕና ያልሆኑ ተያያዥ ሁኔታዎችን እንደሚገመግም ተረድቻለሁ፡፡ እኔም ፍላጎት የሌሉኝን እና ለተሳትፎ ምንም አይነት ሽልማት ባለማሳተፍ፣ በማቆም እና በመዘለል ምክንያት ምንም አይነት ቅጣት እንደማይኖር ተረድቻለሁ፡፡በተጨማሪም፣ የዚህ ጥናት የሚጠበቀውን ጥቅም ተረድቻለሁ እናም ጥያቄዎች እና ጥርጣሬዎች ባጋጠሙኝ ጊዜ መርማሪውን ለማግኘት አድራሻ አግኝቻለሁ፡፡ ስለዚህ ስምምነቱን እገልጻለው የስሜን የመጀመሪያ ሆሄያት፡ የአሳታፊ ስም መጀመሪያ ---------- ---------- የጠያቂ ስም ------ ---------- ፊርማ ---------- የቃለ መጠይቁ ቀን ቀ/ወ/ዓ.ም----------

መለየ

የቀበሌ ስም----------መጠይቅ መለያ ቁጥር----------የጉብኝት ቀን----------

የጠያቂው ስም----------ፍርማ----------

ሀ. የሶሺዮ-ስነ-ሕዝብ ባህሪያት

ተ.ቁ	ጥያቄ	ኮድ የመስጠትና ምላሾች	ዝለል
101	የመላሽ ዕድሜ (ሙሉ ዓመታት)	…….አመት	
102	የትምህርት ደረጃ	1.የልትመረ 2. መምበብና መጸሀፍ የሚችል 3. ከ1-6ኛ ክፍል 4.ከ7-12ኛ 5.12 እና ከዘህ በላይ	
103	ሃይማኖት	1.ክርስቲያን 2. ኦርቶዶክስ 3. ሙስሊም 4.ሌላ ይግለጹ …	
104	የጋብቻ ሁኔታ	1. ባለትዳር 2. ነጠላ 3. የፈታች 4. ባል የሞተባት 5.የተለያዩ	
105	ሥራህ ምንድን ነው?	1.ገበሬ 2.ነገዴ 3.የመንግስት ሰራተኛ 4. የቤት እመቤት 5.ሌላ ይግለጹ ……	
106	የክፍሎች ብዛት	……	
107	የመኝታ ክፍል ሁኔታ	1. ተለያይተዋል 2. ከሌሎች ጋር ተጋርቷል	
108	የመኖሪያ ቦታ	1.ገጠር 2. ከፊል-ከተማ	
109	የቤተሰብ ብዛት	……	
110	ብዜርህ ምንድን ነው?	1.ስልጤ 2.ወለይታ 3.ጉራጌ 4. ሌላ ይግለጹ ……	

ለ. የእናቶች ሁኔታ

201	ከዚህ በፊት እርግዝና አለዎት (የእርግዝና ብዛት)	1.አንደኛ 2.ሁለተኛ 3. ሶስትና ከዚያ በለይ	
202	የአሁኑ እርግዝና የእርግዝና ጊዜ	.....	
203	በቀድሞ እርግዝናዎ ወቅት የወባ በሽታ ነበረዎት?	1. አዎ 2. አይ	ካልሆነ ዝለል 203
204	አዎ ከሆነ የወባ ዓይነቶች	1. ፒ.ኤፍ 2. ፒ.ቪ	
205	በዚህ እርግዝና ወቅት ወባ ነበራችሁ?	1. አዎ 2. አይ	ካልሆነ ዝለል 203
206	አዎ ከሆነ የትኛው ዓይነት የወባ በሽታ ነው?	1. ፒ.ኤፍ 2. ፒ.ቪ	
208	ነፍሰ ጡር ሴቶች አጎበር ሲጠቀሙ ነበር?	1. በየቀኑ 2. እንደ አስፈላጊነቱ 3. ትንኞች ሲታዩ 4. ሌላ ይግለጹ	
209	በዚህ የቅድመ-መሊድ እርግዝና ክትትል አግኝተሽል?	1. አዎ 2. አይ	
210	አዎ ከሆነ ስንት ጊዜ?	.....	
211	አይደለም ከሆነ ለምን አይሆንም	.....	
212	አጎበር አሎትዎት?	1. አዎ 2. አይ	
213	አዎ ከሆነ ከየት	.....	
214	አይደለም ከሆነ, ለምን?	.....	

215	ነፍሰ ጡር እናት ከጥናቱ በፊት በአጎበር ተኝታ ነበር?	1. አዎ 2. አይ	
216	አዎ ከሆነ ስንት ጊዜ	1. በየቀኑ 2. ትንኝ በሚታይበት ጊዜ 3. ሌላ ይግለጹ	
217	አይደለም ከሆነ ለምን አይሆንም?	.....	

ሐ. የአካባቢ፣ የትምህርት እና ሌሎች ምክንያቶች

ተ/ቁ	ጥያቄዎች	ኮድ መስጠት እና ምላሾች	ዝለል
301	በወባ እንዴት እንየዘለን?	1. በትንኝ ንክሻ 2. መጥፎ ወቅት 3. ሌላ ይግለጹ	
302	የወባ በሽታ ምልክት ታውቃልሽ?	1. ራስ ምታት 2.ትኩሳት 3. ሌላ ይግለጹ	
303	መረጃውን ከየት አገኙት?	1. ሬዲዮ 2. ቴሌቪዥን 3. ከሄዝ ኤክስቴንሽን ሠራተኞች 4. ሌላ ይግለጹ	
304	የወባ በሽታ ስርጭትን እንዴት መከላከል እንችላለን	1. በመጠቀም 2. በዲዲቲ በመርጨት 3. የመድሃኒት መከላከያ 4. ሌላ ይግለጹ	
305	በቤቱ ዙሪያ የወባ ትንኝ መራቢያ ቦታ አለ?	1. አዎ 2. አይ	

306	አዎ ከሆነ ምን ታደርጋለህ?	1. ውሃውን ማፍሰስ 2 . ውሃውን የሚረብሽ 3. ሌላ ይግለጹ	
308	ቤተሰብ አጎበር ባለቤት ነው?	1. አዎ 2. አይ	
309	ለጥያቄ 308 "አዎ" ከሆነ ስንት	1.አንድ 2. ሁለት 3. ሶስት እና ከዚያ በላይ	
310	ለ ጥያቄ 308 አይ ከሆነ ዋናው ምንድነው? ምክንያት?	1. የመረጃ እጥረት 2. ዋጋው ውድ ነው። 3. በአካባቢው አይገኝም 4. አልፈለገም ..... 5. ሌሎች ይግለጹ	
311	የ አጎበር የተንጠለጠለበት ቦታ አለዎት?	1. አዎ 2. አይ	
312	ከፍተኛ የወባ ተገለጭ ማነው?	1. ከአምስት ልጆች በታች 2. እርጉዝ ሴቶች 3. አዋቂዎች 4. እርጅና 5. ሌላ, ይግለጹ	
313	በቤተሰብ ውስጥ ወባን ለመከላከል ቅድሚያ የሚሰጠው ማነው?	1. ከአምስት ልጆች በታች 2. እርጉዝ ሴቶች 3. አዋቂዎች 4. እርጅና 5. ሌላ, ይግለጹ	

314	አይቲኤን ወባን ይከላከላል?	1. አዎ 2. አይ	
315	አይቲኤን እንዴት ወባን ይከላከላል መተላለፍ?	1. አካላዊ እንቅፋቶች 2. ትንኞችን ይገድላል 3.የሚያበሳጭ ትንኝ 4. አልታወቀም 5. ሌላ፣ ይግለጹ.....	
316	አንድ ሰው አጎበር ምን ያህል ተደጋጋሚ እና መቼ መጠቀም አለበት?	1.በየምሽቱ 2. ትንኝ በሚታይበት ጊዜ 3.ወቅታዊ 4. ሌሎች ይግለጹ	
317	ነፍሰ ጡር እናት አጎበር ተጠቀመች?	1. አዎ 2. አይ	
318	አዎ ከሆነ ስንት ጊዜ?	1. በየቀኑ 2. ትንኞች ሲታዩ 3. ሌላ ይግለጹ.....	
319	ከላይ ቁጥር 318 ከሆነ ለምን አይሆንም?	1.በቤት ውስጥ ምንም ትንኝ አይታይም 2.ተረሳ 3. አልፈለገም 4. ሌሎች፣ ይግለጹ.....	
320	ነፍሰ ጡር እናት አጎበር ተጠቀመች?	1. አዎ 2. አይ	
321	በአልጋ መረብ ስር መተኛት ማንኛውንም ነገር ያስከትላል?	1. አዎ 2. አይ	
322	አዎ ከሆነ፣ ወደ 321፣ ዋናዎቹ ችግሮች	1. ምንም ምቾት	

	ምንድን ናቸው?	2. ምክንያት ሙቀት 3. የአየር ማንጠልጠያ 4. ሌላ፣ ይግለጹ	
323	በአልጋ መረብ ስር መተኛት ማንኛውንም ነገር ያስከትላል? ችግር?	1. አዎ 2. አይ	

መ .በጥናቱ ወቅት የሚስተዋሉ ነጥቦች (ምክንያቶች)

ተ/ቁ	መከበር ያለባቸው ነጥቦች	ኮድ መስጠት እና ምላሾች	ዝለል
401	ለመኝታ አልጋዎች ብዛት	1. አንድ 2.ሁለት 3. ሶስት እና ከዚያ በላይ	
402	በቤተሰብ ውስጥ የታዩ የ አጎበር ብዛት	1. አንድ 2.ሁለት 3. ሶስት እና ከዚያ በላይ	
403	በአልጋ መረቦች የተስተዋሉ የአልጋዎች / የመኝታ ቦታዎች ብዛት	1. አንድ 2.ሁለት 3. ሶስት እና ከዚያ በላይ	
404	በቤተሰብ ውስጥ ጥቅም ላይ የዋሉ የ አጎበር ዓይነቶች	1.እንደገና ሊታከም የሚችል 2.በቋሚነት መታከም	
405	አጎበር በትክክል የሚንጠለጠልበት ቦታ አለ?	1. አዎ 2. አይ	
406	በአልጋ መረብ ላይ የተንጠለጠለ የመኝታ ቦታ በትክክል ነው?	1. አዎ 2. አይ	

		3. ሌላ ይግለጹ	
407	በአልጋው መረብ ውስጥ ቀዳዳ(ዙፋን) አለ?	1. አዎ 2. አይ	
408	ነፍሰ ጡር እናት ከጥናቱ በፊት በአይቲኤን ተኝታ ነበር?	1. አዎ 2. አይ	

ሠ ስለ አጠቃቀም

409 ነፍሰ ጡር እናት በየቀኑ አጎበር ትጠቀም ነበር? 1. አዎ 2. አይ

ጠያቂ/ታዛቢ ስም.....
ፊርማ .... ቀን .....

የተቆጣጣሪው ስም .....

ፊርማ .....

የትኩረት ቡድን የውይይት መመሪያ

ሀ. መግቢያ

1. ወደዚህ ክፍለ ጊዜ ስለመጡ እናመሰግናለን

2. በተቻለ መጠን ጊዜያችንን በብቃት ለመጠቀም እንሞክራለን።

3. እራስዎን እና ከየት እንደመጡ ያስተዋውቁ

ለ. ዓላማ

1. ስለ ITNs አጠቃቀም እና ስለ ወሳኙ ምክንያቶች ያለዎትን ምላሽ እንወያይበታለን።

2. በሁሉም ሃሳቦችዎ, አስተያየቶችዎ እና ጥቆማዎችዎ ላይ ፍላጎት አለኝ.

3. ሁሉም አስተያየቶች, አዎንታዊም ሆነ አሉታዊ ለውይይት ይቀበላሉ.

5. እባክዎን እርስ በርስ ለመስማማት ወይም ላለመስማማት ነፃነት ይሰማዎ.

ማስታወሻ ለመያዝ እየሞከርን ምንም አይነት ሃሳብዎን እንዳያመልጠን ሁሉንም አስተያየቶችዎን እንመዘግባለን። እና ሁሉም አስተያየቶችዎ ሚስጥራዊ እንደሆኑ እና ለምርምር ዓላማ ብቻ እንደሚውሉ አረጋግጣለሁ።

ክፍለ ጊዜያችን የቡድን ውይይት እንዲሆን እፈልጋለሁ፣ ስለዚህ እኔ እስክጠራህ መጠበቅ አያስፈልግም። እባኮትን አንድ በአንድ ተናገሩ፣ ስለዚህም ቴፕ መቅጃው እያንዳንዱን አስተያየትዎን እና አስተያየትዎን እንዲወስድ።

ለነፍሰ ጡር ሴቶች የትኩረት ቡድን ውይይት

1. ወባ በአካባቢያችሁ ያለው ችግር እና መንስኤው ምን ያህል እንደሆነ ሊነግሩኝ ይችላሉ?

2. የወባ በሽታን የመከላከል እና የመቆጣጠር ዘዴዎችን ንገረኝ?

3. በአከባቢዎ ያሉትን አጠቃላይ የአይቲኤን አጠቃቀም እና ተያያዥ ሁኔታዎችን ሊነግሩኝ ይችላሉ?

4. በአካባቢዎ ውስጥ ለቡድን ቅድሚያ የሚሰጠው ማነው?

5. ነፍሰ ጡር እናት ለምን በየቀኑ ITN አትጠቀምም?

6. በአካባቢዎ ባሉ ነፍሰ ጡር እናቶች አጎበር አጠቃቀም ላይ ተጽእኖ የሚያሳድሩ ዋና ዋና ምክንያቶችን መግለጽ ይችላሉ?

7. ለኮንቲ ለማሻሻል ምን ትጠቁማላችሁ

ከማለቂያው በፊት፣ በእርግዝና ወቅት የአይቲኤን አጠቃቀምን በተመለከተ እና ስለ ተወያዮቹ ሊናገሩ የሚፈልጉት ተጨማሪ ነገር ካለ እያንዳንዳቸውን እጠይቃለሁ።

ወደዚህ ክፍለ ጊዜ ስለመጡ በጣም እናመሰግናለን። ጊዜህ በጣም የተመሰገነ ነው እና ግንዛቤዎችህ በጣም አጋዥ ነበሩ።