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Malaria Surveillance System Evaluation in Ankober Woreda North Shewa, Amhara Region, Ethiopia, 2022

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Abstract:
Background: Malaria is a major public health concern worldwide, with the African region accounting for the majority of cases. Routine malaria surveillance data is crucial for assessing incidence and trends over time and detecting cases early for prompt management. The purpose of evaluating malaria surveillance systems is to assess how well they operate to meet their objectives and ensure efficient and effective monitoring of problems. This study aimed to evaluate and assess the performance of the existing malaria surveillance system and the status of surveillance attributes of malaria in Ankober woreda, North Shewa, Amhara. General objective: To evaluate and assess the performance of the existing Malaria surveillance system and the status of surveillance attributes of malaria in Ankober woreda, North Shewa, Amhara from December 16-26 2022. Method: A descriptive cross-sectional study were conducted from December 16-26, 2022. Ankober woreda were selected randomly among 239 malaria elimination targeted districts and total of nine health facilities were selected. The data were collected from surveillance officers in the selected health facilities using CDC surveillance system evaluation guideline check-list. Result: The results showed that case definitions were posted in all health centers, and understanding of them was good. The woreda reported a total of 26 confirmed malaria cases among 195 clinically suspected cases and zero deaths in 2014 EFY. The overall completeness and timeliness of the woreda surveillance for 2022 were 100% and 97%, respectively. Malaria epidemic monitoring charts were used to detect changes in cases but not analyzed by place and person. Irregular feedback and supportive supervision were conducted. High staff turnover and less trained and poorly incentivized health personnel with poor motivation and job satisfaction were found. The surveillance system was found to be useful, simple, flexible, acceptable, sensitive, and representative to all surveillance officers. Conclusion: Malaria surveillance system found to be satisfactory to achieve the intended objective of surveillance for public health action. Most surveillance system attributes are good. Working surveillance as an additional job and reduced training opportunity added with poor incentive mechanism will make low motivation and satisfaction with their job that definitely affect the stability of the system. The Malaria surveillance system presented in all assessed health institutions of Ankober woreda was found to be able to determine the magnitude of the disease for planning and intervention and detect change in malaria mortality and morbidity.

BACKGROUND

Public health surveillance is the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health(1). Public health surveillance systems have been developed to address a range of public health needs and is considered to be an essential public health function. The number and variety of Public health surveillance systems will likely increase with advances in electronic data interchange(2).

The objectives of having public health surveillance in a country are firstly to detect any disease outbreaks or unusual events and early warning of potential threats to public health which may be disease specific or multi-disease in nature, secondly to provide information which may be used to monitor and evaluate the impact of disease prevention and control program and thirdly to monitor trend in communicable disease over time to assess the present situation so that we can be effective in investigating, controlling, and preventing disease in the population and to link with public health action and to monitor progress towards disease control objectives(3).

Even though efforts to establish Malaria surveillance system was initiated in Ethiopia 1947 when the government issued quarantine rules, these efforts were not supported with appropriate resources thus; surveillance was limited in scope and usefulness. Lack of functional surveillance system that can guide timely and effective health intervention has been a common problem to the African region. Thus, the African States through the WHO Africa regional office (WHO/AFRO) made a resolution (resolution AFRO/RC48/R2) in September 1998 to develop an integrated disease surveillance and response (IDSR) initiative as a regional strategy to effectively control priority communicable diseases in the African region. The reason for Malaria inclusion under surveillance is due to its significant public health importance it poses and effective prevention and control measures it have(4).

Ethiopia had adapted a comprehensive strategy recommended by WHO for member state during the 48th assembly in 1998 for improving communicable diseases surveillance and response through Integrated Disease Surveillance and response (IDSR). After the implementation of IDSR, The Government of Federal Democratic Republic of Ethiopia has embarked country wide reform initiative using the Business Process Reengineering (BPR) as a tool in 2005(5).

Accordingly, federal ministry of health (FMoH) evaluates IDSR and recommend to establish Public Health Emergency Management (PHEM) as of 2009. One of the major activities of PHEM is to take over the disease's surveillance parallel to preparedness, response and rehabilitation in any health-related emergencies and outbreaks. Malaria was one of the diseases selected to be under surveillance system due to its huge burden (morbidity and mortality) The PHEM cascades down to regional level through regional health bureaus, with their zonal health departments and district health offices as shown in the diagram(6).

Malaria remains one of the most important causes of human morbidity and mortality with enormous medical, economic and emotional impact in the world. The World malaria report 2018 estimates that there were 219 million cases of malaria in 2017 globally(7). The WHO African Region accounted for most global cases of malaria (200 million or 92%), followed by the WHO South-East Asia Region with 5% of the cases. Malaria is the 2nd leading cause of death from infectious diseases in Africa, after HIV/AIDs. It continues to claim the lives of more than 435, 000 people each year, largely in Africa. The WHO African Region accounted for 93% of all malaria deaths in 2017. Although countries across the African Region have led a massive effort to expand access to malaria control, the findings of 2017 World Malaria report revealed an increase of 3.5 million cases of malaria in the ten highest burden African countries, as compared to 2016. Despite this increment, there are signs of progress as overall trends show that between 2010 and 2017, the estimated number of new cases of malaria in the African Region cases dropped from 206 million in 2010 to 200 million in 2017, and the number of malaria-related deaths fell from 555,000 to 403,000. Two countries in the Region (Ethiopia and Rwanda) are among 20 countries globally

that experienced a significant decrease in malaria cases (by more than 20%) and deaths in 2017 compared to 2016 (7).

In 2017, an estimated US$ 3.1 billion was invested in malaria control and elimination efforts globally by governments of malaria endemic countries and international partners. The level of investment in 2017 is far from what is required to reach the first two milestones of the Global technical strategy for malaria 2016–2030 (GTS); that is, a reduction of at least 40% in malaria case incidence and mortality rates globally by 2020, compared with 2015 levels(7). Empowering individuals and communities and engaging them to adopt and deploy simple and cost-effective interventions is key in filling existing implementation gaps. We need to accelerate progress as there are significant gaps in the implementation of measures to prevent malaria, and stagnating international and domestic funding for malaria prevention and control. Therefore, renewed political commitment to mobilize all necessary internal and external resources to eliminate malaria and increased investments on malaria prevention and control and ensure inter-sectoral and cross-border collaboration.

To respond to the challenge of rising cases in high-burden countries and reverse these trends, a 'high burden to high impact' (HBHI) country-led approach was launched in November 2018 Supported by WHO and the Roll Back Malaria Partnership, the response seeks to galvanize political will nationally and globally to reduce malaria deaths; it will also use strategic information to drive impact and implement the best global guidance, policies and strategies for malaria-endemic countries, as well as coordinated country responses.

Countries in the Region are continuing to carry out malaria testing and treatment and also relying on preventive measures such the distribution and use of insecticide-treated nets and indoor spraying with insecticides as key strategies in combatting malaria. Even though a considerable proportion of people at risk of malaria infection are not being protected, half of the people at risk of malaria across sub-Saharan Africa are now sleeping under insecticide-treated nets in 2017, as compared to 30% in 2010, indicating some success in behavior change and outreach campaigns. This progress needs to be sustained(8).

RATIONALE OF STUDY

The primary purpose of collecting data on malaria surveillance is for decision-making and action at the local level and evaluation of the system ensure that problems of malaria surveillance are being monitored efficiently and effectively(1). The information generated from malaria surveillance informs international financiers of malaria program and are an important determinant of future funding, regularly assess whether plans are progressing as expected or whether adjustments are required, allocate resources to the populations most in need in order to achieve the greatest possible public health impact, evaluate whether the surveillance objectives have been met and to learn what has worked and what has not, so that more efficient, effective program can be designed, advocate for investment in malaria surveillance and track progress toward elimination.(9) Malaria surveillance should be evaluated periodically, and the evaluation should include recommendations for improving quality, efficiency, and usefulness(10). Evaluation of Malaria surveillance system promotes the best use of data collection resources and focuses on how well the system operates to meet its purpose and objectives. Surveillance system evaluation allows us to define whether a specific system is useful for a particular public health initiative and is achieving the overarching goals of the public health program and the data collection objectives.

Routine malaria surveillance data is useful for assessing incidence and trends over time and stratification for targeting of malaria control(1).

One of the key GTS milestones for 2020 is elimination of malaria in at least ten countries that were malaria endemic in 2015. Accelerating the elimination of malaria, and eventually interrupting its transmission, requires data and information from surveillance systems to inform decisions on the optimal deployment and impact of interventions(11). Effective surveillance of malaria cases and deaths, and of key entomological and efficacy indicators, is essential for identifying which areas or population groups are at risk of malaria or are vulnerable to reduced efficacy of interventions and also for targeting resources for maximum impact. In turn, this allows for effective programmatic planning, including response to epidemics and intensification of control and prevention measures when necessary. A strong surveillance system requires high levels of access to care and case detection, and complete reporting of health information by all sectors, whether public or private (12). Monitoring and evaluation for core antimalarial interventions in-terms of coverage, quality and target is key and will be monitored to inform actions to be taken(13). Therefore, this project will evaluate the performance of the existing Malaria surveillance system and assess the status of surveillance system attributes of malaria in Ankober woreda, North Shewa, Amhara. The data generated by the study can be used for immediate public health action, program planning and evaluation, and formulating research hypotheses.

Objective of Malaria Surveillance System Evaluation

General Objective:

- Descriptive study to assess the implementation status of the existing Malaria surveillance system and the status of surveillance system attributes of malaria and describe constraints and challenges faced in the process of implementing malaria surveillance in Ankober woreda, North Shewa, Amhara from June-August 2022.

Specific Objectives:

- To assess the implementation status of core surveillance activities such as case detection, reporting, analysis and response system in the woreda
- To evaluate the status of surveillance system attributes of malaria
- To describe constraints and challenges faced in the process of implementing malaria surveillance

METHOD

Study Area

Malaria surveillance system evaluation were carried out in Ankober woreda of North Shewa in Amhara region. Ankober is one of the 24 woredas in North Shewa and the former seat of the Shewan kings, which is located 172km in Northeast of Addis ababa, the capital of Ethiopia and 42km east of zonal capital Debre/birhane at the elevation of 2,465. Ankober had served as a tent capital for six Shewan kings until Emperor Minilik II moved to Entoto in 1878. Several churches rich in paintings and manuscripts, along with the splendid geographical feature are awesome assets of Ankober. From the top of Ankober Palace Lodge, you can clearly see the separation point of the highland part of Ethiopia from the rift valley gorge and there is a chance to see the Gelada baboon troops, the endemic primates to Ethiopia. The Woreda is constructed by 3 urban & 19 rural kebeles. The woreda has 6 health center, 19 health post, 6 private clinic, 1 pharmacy, 77- health professional and 34- health extension workers. The woreda has road facility and

electricity. Total population of the woreda is 92,132 and population who lives in Malarious area is 60,689 (65.87%).

Study Design and Period
A descriptive cross-sectional study was conducted from December 16-26, 2022 to evaluate the current status malaria surveillance system.

Source and Study Population
The source population for the study is the 239 malaria elimination targeted districts and the study population is Ankober woreda health office and selected health facilities (health centers and health posts) in the woreda.

Sample Size and Sampling Technique
Among the 239 malaria elimination targeted woredas, Ankober woreda were selected by simple random sampling. Then, a total of nine health facilities (three health center and six health posts) were selected presenting with good and poor surveillance practice as judged by regional and woreda health offices, which is 36% of the total government health facilities (25). The study subjects were the woreda health office and nine selected health facilities. In each study site, health professionals working as a PHEM officer were asked to respond to the questions.

Inclusion and Exclusion Criteria
Public Health Emergency Management Officers/ Surveillance officers irrespective of their profession will be asked the questions. Officers who are in annual leave, critically sick or on field mission were replaced by assistants and if assistant officers are not available, the health facility were replaced by another facility.

Data Collection Method and Analysis
The data were collected from surveillance officers in the selected health facilities and staffs of the health institutions (PHEM officers and HEWs) using CDC surveillance system evaluation guideline check-list. Secondary data sources such as surveillance report completeness and timeliness as well as malaria surveillance data, supervision report, written feedbacks, preparedness plans were also be reviewed. Collected data were transferred in to electronic version and descriptive analysis were performed using Microsoft excel 2013.

Ethical Clearance
Ethical clearance to conduct the study were obtained from Ethiopian Public Health Institute and again permission from zonal health departments were obtained. Request letter were provided for the selected health office and health facilities for their participation on the study.

Consent Form:
Detailed information about the study were provided to PHEM/surveillance officers' that the study has no risk to any of respondents and specific written consent were provided attached at the end of the document.

Conflict of Interest:
The principal investigator declared that, there is no conflict of interest for this project.

Funding Declaration:
This research was not funded by any external sources

Author Contribution Declaration:
T.A conceived and designed the study. B.H support the analysis and edited the manuscript. B.T, T.A has reviewed and approve the manuscript.

Case Definition
Standard Case Definition of Malaria:
Any person with fever or fever with headache, rigor, back pain, chills, sweats, myalgia, nausea, and vomiting diagnosed clinically as malaria.

Confirmed Cases of Malaria:
A suspected case confirmed by microscopy or RDT for plasmodium parasites.

Operational Definitions
Simplicity:
The simplicity of a public health surveillance system refers to both its structure and ease of operation surveillance system.

Acceptability:
Reflects the willingness of individuals and institutions to participate in the surveillance system.

Data quality:
Data quality is the completeness and validity of the data recorded in the public health surveillance system.

Representativeness:
Is the ability of the system to describe health events accurately in terms of time, place and person.

Sensitivity:
Sensitivity is the capacity of the system to detect the highest proportion of true cases.

Stability:
Refers to the reliability (i.e., the ability to collect, manage, and provide data properly without failure) and availability (the ability to be operational when it is needed) of the public health surveillance system.

Timeliness:
Is the ability of the system to trigger appropriate action in time.

Usefulness:
Refers to the relevance of the system in terms of feeding information for action.

Predictive Value Positive:
Is the proportion of reported cases that actually have the health-related event under surveillance.

Flexibility:
Is the ability of the system to adapt to changing needs such as the addition of a new disease, the collection of additional data, and change in case definition.

Completeness:
Proportion of all expected data reports that were submitted to public health surveillance.

Data Quality Control
Data collected at every level were crosschecked with the data available at national level and zonal level and completeness of the information after every interview were checked.

Dissemination of Findings
Once the final report is confirmed by the academic mentor, written report will be forwarded to North Shewa health department, Ankober woreda health offices, EPHI and Saint Paul's Hospital Millennium Medical College, department of public health.

Budget Summery
The project was costed a total of about $1,479.42 equivalent to 41,423.76 Ethiopian birr and had got a free technical support and mentoring from volunteer senior FETP graduates and colleagues.

RESULT

Availability of Surveillance Manuals, Forms and Registers
Malaria is reported on weekly bases however during epidemic the reporting will be changed to daily basis in Ankober woreda. Among the assessed 9 health facilities and woreda health office, only the woreda had national PHEM guideline but two health centers and a single health post had Amharic version of PHEM guideline prepared by APHI. However, the remaining 1 health center and 5 health posts didn't have the national PHEM guideline as well as regional Amharic version. All visited three health centers had standard malaria diagnosis and treatment guideline and only Gorebela health center had malaria epidemic prevention and control guideline. There was no shortage of weekly reporting formats in the past six months in 7 (77.78%) of nine visited health facilities and health office but all health facilities didn't have case investigation form, line list, and daily epidemic reporting format except the woreda health office. There were standardized registers to record the basic data elements of malaria at all the visited health centers but not in HPs.

Case Detection, Confirmation and Registration
The surveillance system capture data on cases of malaria suspected fever case, total malaria cases (confirmed and clinical) for outpatient, inpatient and deaths and confirmed malaria cases by species. Aliyu Amba Health center, Gorebela health center and woreda health office had Malaria case definitions posted and understanding of this case definition at those visited health facility was good as explained by some of health workers working in OPDs during the time of field visit. On the other hand, from all the assessed health posts only 3 (50%) of 6 had the community case definition for malaria but health extension workers didn't use the case definition for treatment of cases except detection and referring to the HCs. The health professionals were detecting any suspected cases of malaria using the case definition and laboratory investigation (BF and RDT) at the health center level but none of laboratory investigation is done at health post level. In all visited health posts, health extension workers complained of lack of RDT and obliged to refer most of malaria suspected cases to health center for microscopic (BF) or RDT investigation.

The surveillance system encourages community participation to detect and respond to disease epidemics through health extension program. All health centers properly register case records using standard registers however in health posts, they only use patient history cards as a register. Contacts of malaria cases are not investigated and contact screening were not done and there is no either paper based or electronic patient registry in all visited health posts. Entomological investigation not done yet.

Reporting and Quality of Data

The woreda did received a total of 468 weekly reports from six government health centers and three private clinics and had sent a total of 52 weekly reports to zonal health departments in the past one year (2022/2023). The woreda did received and report a total of 26 confirmed malaria cases (11 Pf and 15 PV) among 195 clinically suspected cases and zero deaths in 2014 EFY. The overall completeness and timeliness of the woreda for 2022 were 100% (21rep/21wk) and 97% respectively as reported from woreda health office. All health facilities report weekly malaria cases via SMS or phone call but the woreda reports malaria cases to zonal health department via E-mail or paper based integrated with other weekly reportable diseases but may use phone in some cases and for immediately reportable cases. Reporting time of malaria from health facility to Woreda health office were every Monday till mid-day and from woreda health office to zonal health department every Tuesday till mid-day and to the Regional Health Bureau every Wednesday till mid-day and finally to EPHI every Thursday till mid-day.

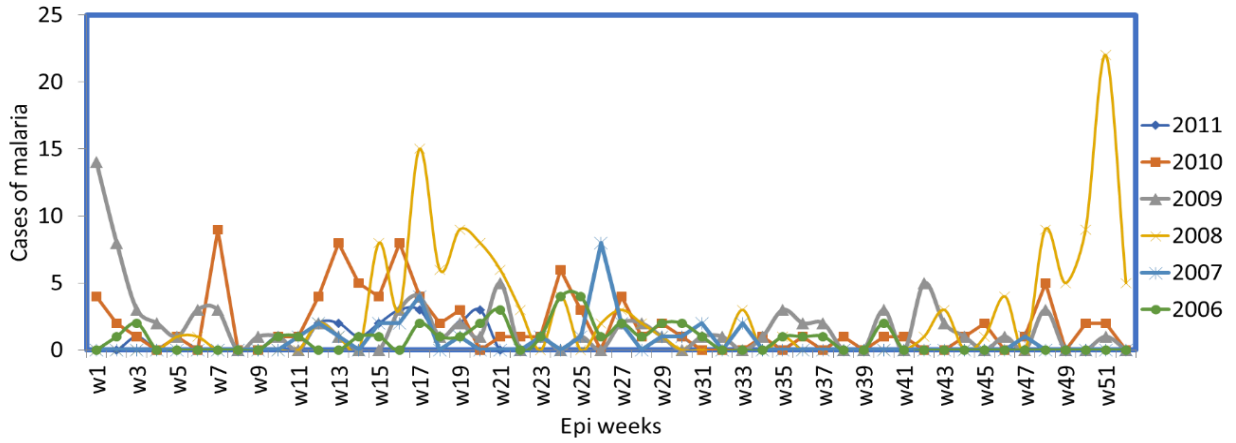

Figure 1: Trends of confirmed malaria cases by WHO epidemiological week from 20011-2014 EFY in Ankober woreda

Data quality at health facility level was assessed by completeness of reporting forms. All variables of the reported registers are properly and completely filled in Aliyu amba and Gorebela health centers but in Gorgo health center, the copy of reports was not found in the weekly reporting formats for 5 weeks. The information registered on the weekly reporting form matches with patient record at the health facility and data at zonal level confirmed by documented reports.

Data Analysis

In all visited health facilities, there was no a responsible person for data analysis but all health centers (not health posts) use malaria epidemic monitoring chart for cases trend monitoring and used to detect if there is an epidemic. In the woreda health office data analysis made on irregular basis by PHEM officer but analysis was not complete i.e., done only by time (not incorporating place and person). The information collected was utilized to monitor threshold which is done only

by doubling previous year same season cases but not using the third quartile of the five years morbidity data.

Epidemic Preparedness and Response:

The Woreda health office had a plan for epidemic preparedness and response supported by malaria emergency budget but all visited health centers and health posts has no epidemic preparedness andresponse plan. Even though the Woreda health office had budget for malaria emergence, in case of experiencing any emergency other than malaria, the Woreda mobilized the budget for response activity. Woreda health office have non-functional/deactivated rapid response team and all of the assessed health centers (not include health posts) have non-functional emergency/epidemic management committee but will be revitalized when emergency happened. There was no vehicle assigned for emergency response at Woreda health office. There was no malaria outbreak in the past 2022 but there was measles outbreak which is investigated and responded timely and confirmed for the presence of RRT and epidemic management committee (EMC) by meeting minute.

Feedback and Supervision

Both verbal and written feedback integrated with routine supportive supervision was given to all visited health facilities from woreda PHEM Core Process together with other departments on quarterly basis but evidence of sample reports found only in two assessed health centers. The zonal health department did give feedback to Ankober woreda on weekly basis with sufficient evidence of reports. The assessment did find a sample report of a recent supportive supervision in 7 (77.78%) of 9 health facilities but it was not specifically on malaria surveillance. Similarly, health center made supervision once a month to each respective health posts in the catchment area.

Training:

All assessed health facility focal persons, health care providers, and health extension workers who are assigned as a focal point for surveillance responded that none of them got a formal training other than having an orientation on surveillance and epidemic management and most surveillance focal persons participating in the study were new for the system and this is due to high staff turnover as recognized by participants. Mobile card expense for reporting and reduced training opportunity added with non-incentivized health personnel is difficult for operation. Woreda health office PHEM Core Process owner did get a training on different topics (malaria elimination, basic level PHEM training) but didn't have a training on frontline field epidemiology training program (FFETP).

Resources Used for Surveillance System

All visited health centers and two visited health posts have electricity and the rest facilities use solar system as source of electricity for refrigerators. All visited health centers and the woreda health office have desktop computers with eHMIS software, printers, motorcycles and telephone service. The surveillance system lacks materials and equipment's like generators, IEC materials and projectors.

Surveillance System Attributes

Usefulness:

All health facilities accepted that the surveillance system is very useful to detect outbreaks, determine magnitude of morbidity and mortality, evaluate the effectiveness of malaria

prevention and control programs. The respondents confirmed that the surveillance system is helpful for early case detections and take actions to prevent and control epidemics. Malaria trend analysis was made in Woreda health office and all health centers to detect epidemic which shows weekly count of malaria cases and epidemic threshold which is posted. However, those health centers didn't update their monitoring chart every week, so that they are not able to detect an epidemic.

Simplicity:
All respondents in the assessed health facilities responded, the case definition of malaria (both standard and community) is simple and easy to understand. Community case definitions which is prepared by local languages is easy to be used by those who can't read English particularly health extension workers and community health workers at village level. The reporting formats being used are also very easy to understand. An average time to fill formats took less than 10 minutes for health facilities. Data collected at Woreda level by paper based then need to be converted to electronic form for documentation, as a result it took relatively long time at woreda health office.

Flexibility:
All visited Health Office and Health Facilities declared that the currently used reporting formats and procedures were flexible and could accommodate other newly occurring health events (diseases) without much difficulty and are easy to integrate with other systems and the formats were said to be easy and comprehensive to record and report. This is due to the availability of a blank column for others. It is also easy to use new technologies.

Acceptability:
The engagement of the reporting agents was very satisfactory and the reporting rate of all health facilities were 100% over the past 21 epi reporting weeks. The case definition and reporting tools were acceptable by all stakeholders. All Governmental reporting agents were 6 Health Centers and 19 Health Posts respectively have accepted and have been engaged in the surveillance system unless they are busy with other competing activities.

Representativeness:
In the district all rural Kebeles has their own functional health post and the population under surveillance at each kebele is below 5,000. The population has good health seeking behavior for the disease. The surveillance system has the capacity to pick all public health emergencies in the community. However, the weekly reporting formats lack some important variables like age (only incorporated less than 5 and above 5 year), sex and other possible risk factors.

Sensitivity:
All health centers reported that the malaria case definition used now can pick every malaria cases correctly. The community case definition helps particularly the health extension workers (HEWs), and community health workers (CHWs) to identify and notify all suspected malaria cases early at the community level.

Predictive Value Positive:
the positive predictive value of the woreda for this year is 13.3% and in comparison, with the previous year (19.2%), it is decreased by 44.36%.

Years	Total cas Tested for malaria	Malaria Treated case				Positivity rates/%/
		PF	PV	Clinical malaria	Total	
2006	194	16	24	0	40	20.6
2007	92	15	17	0	32	34.8
2008	410	73	64	0	137	33.4
2009	591	43	45	0	88	14.9
2010	506	54	43	0	97	19.2
2011	195	11	15	0	26	13.3

Figure 2: Positive predictive value of malaria cases from 20011-2014 EFY, Ankober, Ethiopia

Timeliness:
The surveillance report timeliness of the district in 2022was 97%.

Completeness:
The Woreda surveillance report completeness in 2022 was 100%.

Stability:
All health facilities responded that data were collected by their own phone call and officers didn't get refilled their expenses and also staff turnover and lack of resources had affected surveillance activities. When trained surveillance personnel and focal persons leave the position there will be difficulties in data collection and reporting.

DISCUSSION

In all assessed Health Facilities, there were available and posted standard and community case definition of the majority reportable diseases including malaria which is in line with surveillance evaluations done in Enderta, Tigray and halaba special woreda, SNNPR(18,19) but it was not actually used at the visited health posts and didn't enhances the case detection contrary to the study done in Adama town, Oromia and Enderta, Tigray Region(18,20). Malaria is the one of disease in the country which can be diagnosed and treated by health extension workers at health post level but in all visited health posts, malaria is not diagnosed and treated rather than referring to nearby HCs in Ankober woreda. The visited facilities lack case investigation form, line list, case-based forms and daily epidemic reporting format, but these formats are commonly found in other malaria elimination targeted woredas like lasta and lalibela woredas.

Ankober woreda PHEM core process reported 26 total confirmed malaria cases (11 PF and 15 PV) among 195 suspected cases of malaria and zero deaths among all age groups in 2014 EFY which is confirmed by the eHMIS data. The reported case is low and insignificant and the number of plasmodium falciparum is lower than vivax in contradiction to woredas not targeted for elimination like halaba special woreda and Adama town, Oromia(19,20). Lack of diagnostic materials like RDT in health posts make difficult for diagnoses and treatment difficult at health post level as deviated from the study in adama, Oromia. Contacts of malaria cases screening and investigation not done and there is no either paper based or electronic patient registry in all visited health posts in line with the study done in south east parts of Tigray for electronic based but deviated on paper based. Data analysis by time were done irregularly for trend analysis but analysis by place and person, creating frequency tables, calculating rates, and plotting simple graphs was poor like most of the woredas in the country.

The Malaria surveillance system presented in all assessed health institutions was able to determine the magnitude of the disease for planning and intervention as the overall completeness and timeliness of the woreda for 2022 were 100% (21rep/21wk) and 97% respectively, which is above the minimum requirement recommended by WHO. Even though frequent training is mandatory for sustainable and stable surveillance system, officers who did have a training on relevant areas in 2014 EFY is very low as compared to the study done in Asagirt and this is due to high staff turnover. Written feedback was given to two assessed health centers from Woreda health office PHEM Core Process with evidence of sample reports but there is inconsistencies and oral feedback is given to most health facilities on irregular bases, which is not appropriate form of giving feedback and not trusted during system evaluation since there is no evidence of giving feedback like written ones.

Emergency preparedness and response plan were prepared in the Woreda health office supported by malaria emergence budget. However, in case of experiencing any emergency other than malaria, the Woreda will mobilized the budget for response activity that may affect the preparedness level during times of outbreaks. Rapid Response Team is found in the woreda and epidemic management committee in the health centers but they need to have a regular meeting for discussing and anticipating public health emergencies and need to have a written documents confirming the presence of the committee. Lack of RDT kit for malaria in health posts obliged HEWs to refer suspected cases to nearby HC. Most surveillance system attributes are good like the study in Enderta, Tigray and Adama but the stability of the system is in misfortune. Mobile card expense for reporting were found to be very challenging and surveillance officers are complaining for, there is no refunding for the expense. Working surveillance as an additional job and reduced training opportunity added with poor incentive mechanism may make low motivation and satisfaction with their job that definitely did affect the surveillance activities and subsequently affect the stability of the system. Contrary to this finding, the study in Enderta confirmed that, officers working in surveillance and epidemic management had got 100 birr per month for mobile charging and frequent training opportunities (18).

Positive predictive value is low (13.3%) as compared with the study in Enderta, Tigray PPV (36%), which indicates many of the detected cases are not true cases, may be due to less specific case definition or highly sensitive case definition used but it is expected using sensitive case definitions to capture all cases of malaria. Health seeking behavior of the community for malaria were found to be good especially urban community, which is a good opportunity for active surveillance and subsequently for elimination of malaria.

CONCLUSION

The Malaria surveillance system presented in all assessed health institutions of Ankober woreda was found to be able to determine the magnitude of the disease for planning and intervention and detect change in malaria mortality and morbidity as the overall completeness and timeliness of the woreda for 2022 were 100% (21rep/21wk) and 97% respectively, which is above the minimum requirement recommended by WHO. Malaria surveillance system were also found to be satisfactory to achieve the intended objective of surveillance for public health action. It is useful, simple, flexible, acceptable, sensitive, and representative to all surveillance officers but not stable. Transmission of malaria in the woreda is found to be low and burden of the diseases is insignificant. Timeliness and completeness of report was found to be very good but for the satisfactory result of the surveillance system, the positive predictive value (13.3%) should be improved.

RECOMMENDATION

- Surveillance data should be analyzed regularly by place, person and time at all level and interpreted for public health action.
- Regular training and workshop on malaria surveillance and surveillance-related activities is required for human resource skill build up, since the woreda is in elimination phase.
- Political commitment and leadership should take ownership of EPRP implementation
- Health facilities should prepare their own EPRP
- Different reporting formats, RDT kits generator during times of electricity off, and projectors need to be in place for all health facilities
- Regular supportive supervision using checklist should be done at each level to increase the quality of the surveillance system
- The stability of the surveillance at health facility level (especially at HP) needs a special attention since they are working as an additional job.

The positive predictive value should be improved.

REFERENCES

1. Lee LM. Updated Guidelines for Evaluating Public Health Surveillance Systems Recommendations from the Guidelines Working Group. 2014;(September).

2. Calba C, Goutard FL, Hoinville L, Hendrikx P, Lindberg A, Saegerman C, et al. Surveillance systems evaluation : a systematic review of the existing approaches. ??? [Internet]. 2015; Available from: ???

3. National A, State R, Bureau H, Agency C. Amhara National Regional State Health Bureau Ethiopia , Amhara Region Infectious Disease Surveillance (AmRids) Project Completion Report. 2015;(February).

4. Choi BCK. The Past , Present , and Future of Public Health Surveillance. 2012;2012(Table 1).

5. Surveillance CD. World Health Organization.

6. Public Health Emergency Management. 2012;

7. World malaria report 2018. 2018.

8. Box PO. Current Status of Malaria in Ethiopia : Evaluation of the Burden , Factors for Transmission and Prevention Methods. 2018;7(1):1–6.

9. Malaria surveillance, monitoring & evaluation: a reference manual.

10. Guidelines F. Overview of Evaluating Surveillance Systems. 2013;

11. Vajda ÉA, Webb CE. Assessing the Risk Factors Associated with Malaria in the Highlands of Ethiopia : What Do We Need to Know ? 2017;1–13.

12. Alaria in.

13. Ibrahim BS, Abubakar AA, Bajoga UA. Evaluation of the Malaria Surveillance System in Kaduna State , Nigeria 2016 ISDS 2016 Conference Abstracts Evaluation of the Malaria Surveillance System in Kaduna State , Nigeria 2016. 2016;(May 2017):2016–8.

14. Leader T. WHO Malaria Surveillance Reference Manual. 2018;(May).

15. 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

[Internet]. 2012;11(1):1. Available from: Malaria Journal

16. Report MW. Malaria Surveillance — United States , 2015. 2018;67(7).

17. WHO, diseases surveillance for malaria elimination, An operational manual, Geneva, 2012 available at *(http://www.who.int/about/licensing/copyright_form/en/index.html).*

18. Mesfin A. Addis Ababa University , College of Health Sciences , School of Public Health. Evaluation of surveillance system in South East zone, Enderta Woreda Tigray regional sate, Ethiopia, 2016;

19. Hailu E. Addis Ababa University , College of Health Sciences , School of Public Health Ethiopian Field Epidemiology and Laboratory Training Program (EFETP). Evaluation of Malaria Surveillance System in Halaba Special Woreda, Southern Nations, Nationalities and People Region, 2015

20. Taye G. Evaluation of malaria and measles surveillance system in Adama town, Oromia Region, 2017;