

Attributes, Supportive and Core Functions of Public Health Emergency Surveillance leadership, and Implementation for Tropical Diseases Control

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Abstract

Background

Public health surveillance (PHS) is the continuing organized gathering, investigation, elucidation, and well-timed distribution of health-related information for activities and program evaluation. Conducting a surveillance system evaluation is crucial for monitoring the efficacy and effectiveness of intervention programs in health care systems. Evaluate the Status of Attributes, Supportive and Core Functions implementation of Public Health Emergency Surveillance (PHES) in the case of Awi Zone, Amhara Regional State, Ethiopia, 2020 was the main aim of the study.

Methods

A descriptive prevalence study design was used to evaluate the surveillance system of the Awi zone selected woreda. 25 study sources are used in the study (5 District Health Offices (5HOs), 10 Health Centers (10HCs), and 10 Health Posts (10HPs)). Purposive sampling techniques were utilized. Data were obtained by communicable diseases control the standard format of systematic evaluation of four surveillance units from January to August 2020 through observation, document review, and interviewing surveillance officers and focal persons using a semi-structured survey.

Results

The structure of public health surveillance (PHS) data flow from health posts to health districts be sound structured. However, coordination and supervision of the surveillance activities were not frequent. From those supervised health facilities, most of them are not receiving feedback. There was no budget line, written feedback, epidemic and preparedness, and a response plan regular based on supportive supervision at all visited health facilities.

Conclusions

Supervisions were made as integrated supportive supervision in the last six months. However, there was no program-specific supportive supervision of Public Health Emergency Management (PHEM). Data analysis was not routinely practiced in both visited districts and was not used for decision making. Therefore, we recommend that districts and sub-city health offices should conduct regular surveillance data analysis, perform supportive supervision, avail budgets, and mitigate resource constraints and improve data quality on the job training and supportive supervision.

1. Background

Public health surveillance (PHS) is the continuing organized gathering, investigation, elucidation, and well-timed distribution of health-related information for activities and program evaluation. Sustain the decrease of the trouble of immediately reportable diseases (IRDs), eradicate the disease, and prevent its restitution is the main aim (1).

Surveillance of immediately reportable diseases is recognized as the keystone of Public Health (PH) decision-making and practice. PHS information is critical for monitoring the health status of the community, detecting infectious diseases, and trigger actions to prevent further complications, illness and ensure that these diseases are monitored efficiently and effectively (2).

Information disseminated by a PHS structure could be used for urgent PH accomplishment, program planning, and assessment, and to formulate research suggestions. The PHS system has been developed to take in the hand of many PH needs. They comprise a diversity of information source vital to PH battle (3)

The evaluation of PHS systems should encourage the top to utilize PH assets by ensuring with the aim of only vital difficulty are under PHS and that the PHS system operates proficiently. In so far as likely, the assessment of the PHS system ought to embrace the recommendation for civilizing excellence and competence, e.g., removing pointless repetition. Notably, an assessment must evaluate whether a scheme has served a helpful PH purpose and achieve the system aims (4).

Conducting PHS is key for monitoring the efficacy and effectiveness of interventional programs in the health care system. Effective PHS systems are one of the basic strategies of national disease prevention and control programs. A PHS scheme serves 2 relevant roles; (i) untimely caution of likely threats to PH and (ii) program monitoring of the PHE, which could be emerging-definite or multiple-emergency in life (5). Therefore, the purpose of this study was to evaluate the status of Attributes, Supportive and Core Functions implementation of Public Health Emergency Surveillance in the case of Awi Zone, Amhara Regional State, Ethiopia, 2020.

2. Methods

Study plan and time

The prevalence lessons plan was used based on an “overview of evaluating PHS systems CDCs updated in the 2012 guideline for evaluating PHS system” as a framework for the evaluation to achieve the stated objective of the study from June 2020 to August 2020.

Study unit

The study units were woreda Health Office (HOs) and health facilities (HF). 25 study sites were included in the study, including HO= 5, HC= 10, and HP= 10.

Sample size and techniques

A Zone is one of the Zone in the Amhara Region that reported the highest number of malaria cases in the region this year. We purposely selected to conduct the PHS system evaluation in this zone. 25 sites were selected for the study. About 5(50%) woredas are selected by a convenient sampling method based on

their malaria weekly report caseload and surveillance performances. For each selected Woredas, in each selected HO: 10 HC and each selected HC: 10 HP was selected by purposive.

Selection of health facilities

Health facilities were selected by discussing with district PHEM officers, two HCs and two HP from each woreda were included in the evaluation, similarly, HC was included based on the 2019/2020 PHEM performance by taking HCs that had better performance and least performance. HPs were selected by purposive.

Data collection and Data source

Data collection would be done by face to face interviews using questionnaires/checklists. Answers from respondents (HO head and/or PHEM officers) and observation of tools for surveillance and secondary data review. Based on the WHO structure for monitoring and assessing PHS and response systems for malaria infection, which were used to assess the core activities, supportive functions, and quality components in the Awi zone, Amhara Regional state 2020.

Study variables

- **The Supportive function of the PHS system:** Training, Supervision, Resource, and Feedback
- **The Core function of the PHS system:** Reporting, Data Analysis & Interpretation, and Epidemic preparedness
- **Attributes of PHS scheme:** Flexibility, Usefulness, Simplicity, Acceptability, Timeliness, Completeness, Predictive value, Stability, and Data quality

Statistics administration and investigations

The records were coded and transferred using Epi info 7 and exported to SPSS version 20. Then the mean prevalence, variability, and linear regression were executed by using SPSS statistical software version 20. The variances between groups were handled by analysis of variance (ANOVA).

Data Quality assurance

Data was reviewed by PH experts who have worked in the PHS system. Some data was de-duplicated, especially data from monitoring charts, weekly PHEM reports, and year reports. We cleaned and analyzed the data using Microsoft Office Excel 2016 and epi-data to show report completeness, timeliness, and other variables.

3. Results

Population under Surveillance: Public Health Emergency Management (PHEM) targets all populations to be under surveillance for all 21 diseases nationally and 22 diseases (including Leishmaniasis) in the Awi zone, Amhara Region (Table 1).

Table 1:-Population under Surveillance of Awi Zone and Visited Woredas 2020

S.No	Zone/Woreda Name	Total Population	Male	Female
1	Chagni	48,260	24,613	23,647
2	Ankasha Guagusa	108,376	55,272	53,104
3	Banja	99,967	50,983	48,984
4	Zigem	109,255	55,720	53,535
5	Guagusa Shekudad	108,154	55,159	52,995
Total		474,012	241,746	232,266

The Country PHEM goal all inhabitants in the country to be under PHS for all 22 immediately-reportable diseases. The Awi zone cascade the same structure, with a total population of **1,253,909** in 2020 with population conversion factor region cascade of this, 474012 population under surveillance (Table 2).

Table 2: Number of health facilities in the assessed Woreda of Awi zone, Amhara Region, June 15-25/2020.

S.No	Name of Woreda	Total Population	Number of HFs			
			HCs	HPs	Hospital	
1	Chagni	48,260	2	2	0	
2	Ankasha Guagusa	108,376	2	2	0	
3	Banja	99,967	2	2	0	
4	Zigem	109,255	2	2	0	
5	Guagusa Shekudad	108,154	2	2	0	
Total		474,012	10	10	0	0

Core functions of the PHS system

Case definition: In most of the HFs and districts, standard case definitions of the selected disease are available

Standard case definition: Malaria: A suspected case was confirmed by microscopy or RDT for Plasmodium parasites.

Community case definition: The case definition is used to be aware of the community to notify any suspected cases and to make them aware of the early diagnosis of the priority diseases under surveillance. These are sensitive (loose) case definitions that increase the case detection rate. And **Malaria:** Any person with fever or fever with a headache, back pain, chills, rigor, sweating, muscle pain, nausea, and vomiting or suspected case confirmed by RDT

Data Reporting: No lack of reporting forms in the past six months in every visited HFs and HOs except for four HPs. The weekly reporting rate of the visited HFs over the past 26 weeks (week 27-52/2020) before assessments were 90% (9/10) or HPs, 100% (10/10) for HCs, and 100% (5/5) for woreda. The overall reporting rate of the visited districts for the zonal health department in 2012 EFY for the same week period before the assessment was 96% of Ankesha Guasgusa District, 97% Banja, 100% Changi, 95% Guasgusa, and 95% for Zigem District, whereas the reporting rate of the zonal health department to the regional health bureau was 98%. Among the assessed HFs, 12 (60%) of them reported the highest level of hard copy because close to their receiving. For reporting of any PHS related rumors, the woreda used the phone call to the highest-level body (Zonal). There was a shortage of rumors logbooks and case-based reporting formats.

Data Analysis: In visited Woredas and health institutions, data is not described by person, place, and time. The reason for the respondents failing to analyze the PHS data by place, person, and time was due to they had no awareness regarding the analysis and its use. None of the visited health facilities analyzed the data collected from PHS at their ability. In the majority of 12 (48%) of the assessed HFs, there was a Malaria Monitoring Chart (MMC) to follow the trends of malaria cases in their catchment area.

Epidemic preparedness and management: There were a written epidemic preparedness and response plan for all visited woredas, including some HF level but not secured budget. Current Covid-19 emergency preparedness plan and response plan available at woredas 5 (100%) and 6 (50%) HCs during data collection. All visited HFs responded as there was no scarcity of urgent situation antimicrobials and provisions in the past six months, despite that there were no separately secured contingency drugs and budgets for emergency cases. Regarding the existence and activities of the epidemic management committee, there was established a committee at the woreda and visited facilities. During this assessment, it was identified that the established committee at those levels was working regularly and formulated on all necessary disciplines, especially on Covid-19.

Supporting Functions of the PHS System

Supportive Supervision: During the past six months, the Awi zonal department did not conduct supportive supervision because of time constraints and security issues in the region. Among the 10 visited HCs, 4 (40%) had not been supervised during the past 6 months at higher levels. All HCs were not regularly supervising the HPs under their catchment area. The reasons they responded were due to transportation and budget problems. Many Woredas have conducted integrated supportive supervision for HFs with a limited number of PHS indicators last year. However, during the last six months, this is not performed.

Reporting system, active case searches, and other PHS activities were reviewed in supervised Woredas and HFs.

Feedback: Feedback is a critical activity in strengthening the PHS system. Among woredas and HFs assessed, 09 (60%) of them received feedback from the zonal health department and woreda HOs respectively. Because the zone uses an integrated checklist to supervise woredas and HFs, there is no separate schedule, budget, and checklist for visiting and for giving supportive supervision to their reporting sites on PHEM and PHS activities. Many Woredas give written feedback for HFs with the integration of other activities that consist of a few indicators of PHS activities quarterly. In the majority of observed woredas, the production and dissemination of written feedback for HFs are very poor.

National PHS Manual: We identified that national PHS manuals were available in 6 (60%) PHS units at the facility level. Malaria strategy was accessible in every woreda HOs and HCs. In every assessed HPs, there was no surveillance guideline. The malaria case management protocol was not available in two woredas HOs, but available at six HCs.

Training of PHS Activities: In the last six months, the regional PHEM units being partners have conducted training for zonal and Woreda PHEM focal persons on outbreak investigation, Covid-19 surveillance, and contact tracing of Covid-19. Additionally, there is at least one trained personnel at all visited HCs. However, none health extension worker was trained on surveillance activity.

Resource: All visited HFs and districts compile weekly PHS reports manually. Data were aggregated by computer only at the zonal level. Although there is a computer for PHEM in the district and 100% of the visited HCs lack skill in data management and computer application, that is why they aggregate it manually. All HFs and districts have motorcycles. However, there is not using for PHS activities.

Laboratory Diagnosis: The Amhara National Regional State has two regional investigation laboratories at Dessie and Bahir Dar, which implements confirmatory tests for most of the weekly reportable diseases. Currently, the Bahir Dar regional laboratory starts confirmatory tests for measles. The measured HFs have RDT for the diagnosis of malaria. Blood film was done in all visited HCs. The most serious problem that faced feedback from the national laboratory is delayed and not used for intervention most of the time it takes at least one month.

Attributes of the PHS system

Usefulness: The PHS serves a total population of the Awi zone. From this population, a total of 43131 cases and 1 death of malaria were reported. All gaps in reporting timeliness and completeness as well as documentation malaria PHS system were found useful to measure the burden of the disease on some level. 25 (100%) of the respondents were accepted as the PHS system and its data was helpful to detect cases early, to evaluate the extent of diseases.

Flexibility: All visited Woreda HOs, HCs and HPs responded as the PHEM system ready the reporting pads lithe to inform further new events under immediately reportable case-based conditions.

Acceptability: The suitability of the PHS scheme was determined based on the involvement of the reporting bodies. All reporting bodies allow and are fine involved in the PHS activities, The report completeness status of reporting agents is 100% for HCs and 92 % for HPs. It consists of the readiness of human on whom the PHS is based to supply precise, steady, inclusive, and well-timed information.

Representativeness: A PHS scheme is represented exactly explains the happening of a wellbeing-associated occasion over the moment and its allocation in the human by geography, person, and time. It is determined by contrasting the distinctiveness of reported dealings to all such definite dealings. The primary health care coverage of the zone was 90% and 80% for HCs and HPs respectively.

Simplicity: Within the finding of cases, all respondents (100%) concurred that the case definitions of these need infections of recognizable proof of suspected cases, are simple to get, and can be connected by all levels of wellbeing experts. The respondents at the woreda and wellbeing office levels concurred that the report took approximately 10-15 minutes to spread week after week reports through the phone although it depends on the accessibility of networking. Regarding malaria, it takes 15 minutes if it is diagnosed using microscopy and 15 minutes if the diagnosis is with RDT.

Predictive value positive (PVP): The essential center be put on diseases verification and proceedings can be of assessing provoked by evidence got from the scheme.

Data quality: Sixty (60%) HPs reported incomplete PHS reports. 10 (100%) of them reported clear records to read and understand. 8(80%) of the HCs sent a complete and recorded report to the woreda HOs. 5(100%) of the woreda HOs sent complete and clear data reports to the zonal health office. Reporting formats of weekly and immediately reportable diseases are well understood at the HC levels and HP, but there is a shortage of report formats. Lack of training some health extension workers was observed to be confused with this format.

Stability: In recent times district-level PHEM officers were assigned to perform surveillance activities in the Awi zone. The availability of PHEM focal persons at the district HO and HFs level is a good opportunity for running a PHS system even with limited resources. However, budget constraints are affecting the stability of the system, and advances modify in this system and the workforce will create the system more unsteady and supply-exhaustive.

Completeness and Timeliness:

The overall report completeness and timeliness rate was above the World Health Organization minimum target (80%) in the last five years (Fig. 1). This might be due to increasing awareness of the community and acceptance of the community, health extension workers, and other health providers on of the PHS.

In general, health care providers (HCPs) and health extension workers (HEWs) have a good understanding of the case definitions of malaria, other priority diseases, and surveillance. Report completeness and timeliness were good which above the national target both for the woreda and HFs. Laboratory diagnosis of malaria was available at all levels of the district and HFs were satisfactory. They

only prepared a plan, there is no ready budget and resources to respond to any PHE. Data analysis is only done at the zonal level, there was a lack of skill and resources for data analysis at the district and facility level. Outbreak investigation and response activities were done in a good manner. Supervision activities were poor at the zonal and district level, there were no program-specific supervision activities other than integrated supportive supervision which were conducted in each quarter. This might be because of the bad direction of all parties, insufficient helpful supervision, and feedback, little or no lawful enforcement to the PHS activities, lack of incentives, appropriate training, sense of ownership, and logistics.

4. Discussion

This study intended for the evaluation system of the Awi zone in 2020 by seeing the attributes, core and supportive function implementation of the PHS system and PHS attributes in the district on the whole presentation and using the means of verification to be familiar with gaps or areas that could be strengthened

Systematic assessment ought to address aspects of PH's significance of the health-related events under PHS, purpose, and functionally of the PHS scheme, tools used to functioning the PHS scheme, and the degree of utility. PHS is the methodological, continuing gathering, organization, analysis, and evaluation of information accompanied by the distribution of this information to PH programs to promote PH intervention (6).

In short, PHS is the groundwork for decision-making in PH and empowers decision-makers to provide timely useful evidence. Inlined with the study conducted in Nigeria, 2013–2016, HFs were the primary sources of information. Overall, 65.0% of funding came from partner organizations, and the timeliness of reporting was under the target (approximately 80%), except for 82% in 2012 (7).

Study conduct in Ethiopia in 2019, all required PHS strategy, records, and reporting pads have been properly distributed to HFs. Only the district HO has Emergency Preparedness and Response Plan (EPRP), but the budget needed to respond in the event of an emergency is not funded in terms of time, location, and human, There was no routine information analysis and interpretations. The completeness and timeliness of the weekly information were 100 and 94.6% respectively. Its users found the information collected to be important for detecting outbreaks. The scheme is clear, easy to understand, representative, and could accommodate changes of all stakeholders agreed. In all HFs Written feedbacks were not received. To analyze PHS behaviors in-depth, the supervision checklist obtained in the district was not satisfactory. The positive PV calculated for malaria was 11 percent (8).

Timeliness is the momentum within the ladder in a PHS system. The majority important determines of timeliness is whether the information is submitted in first-rate time to begin investigations and apply interventions. Reporting timeliness should be calculated against criteria established by each country, in compliance with the deadlines set by the WHO Regional Office for Africa. In a PHS framework, critical aspects of reporting timelines include the timeliness of instantaneous notification, i.e., within 24 hours

timeliness of posting weekly and monthly. Start, diagnosis, study, data entry, review, interpretation, and intervention of the PHS scheme have been documented (9).

The completeness of PHS can have varying dimensions and may include reporting sites submitting PHS, case reporting, and PHS data. The completeness of reporting sites, irrespective of the time the report was submitted, refers to the proportion of reporting sites that have submitted a PHS report. For each of the PHS posts, computing completeness of reporting location, which implies pattern analysis and triggers further investigation (10).

Completeness of the case detailing alludes to the coordinate within the prevalence of diseases detailed and the genuine prevalence of diseases. This will be gotten by differentiating the number of notifiable conditions detailed to the following level (over a few times), with the prevalence of diseases recorded within the quiet enrollment over a similar time. Completeness of PHS information is the coordinate within the anticipated information prerequisite and what is detailed, every specific factor collected, enlisted, and validated, if a distinguished variable is not collected routinely (11).

A PHS framework, though still meetings its targets, should be as basic as possible. Acceptance and timeliness are closely linked to simplicity. The amount necessary to enable the program is also influenced by simplicity (12).

With a little extra time, personnel, or allocated funds, an elastic PHS scheme may adjust to evolving information needs or operating conditions, including new events to follow-up, new case definition, new data about an event, and new sources of information. Besides, schemes using common reporting pads (e.g., in electronic information exchange) could simply be incorporated with another scheme and thus might be considered versatile (13).

Most PHS schemes rely on more than easy disease counts. Information commonly collected includes the demographic characteristics of affected persons, details about the health-related event, and the presence or absence of potential risk factors. Reflects the completeness and validity of the information recorded in the PHS system, which includes completeness of records (e.g., blanks – missing or unknown), errors when computing information, influenced by the simplicity of the PHS form, clarity of electronic forms, training, and validation (14).

Acceptability refers to the willingness of individuals who enable the scheme and individuals outside the supporting organization, e.g., individuals who are asked to report information to use schemes. Points of contact between the scheme and its users, including people with health-related incidents and those reporting an emergency, were examined to determine adequacy, knowledge, notification conditions, and simplicity (13, 14).

The sensitivity of a PHS scheme could assess by surveying its ability to exactly distinguish those with the infection or features of interest. As long as the sensitivity remains relatively stable over time, a PHS framework that does not have high sensitivity can still help watch patterns. Sensitivity can also refer to

the capacity to detect outbreaks, and the ability to track changes in the number of diseases over time in requires, to verify the information gathered, and to gather information outside of the scheme to determine the frequency of the condition within the community (13).

Sensitivity and PV determination offers multiple views of points on how well the scheme operates. The proportion of recorded diseases that have health-related occurrence under PHS depends on the population vulnerability, specificity, and prevalence of the diseases. The impact of low PV reported using repeated false-positive findings, insufficient follow-up of non-diseases, improper detection of outbreaks (artifacts), wastage of resources, and excessive public concern (1, 14).

A PHS framework that's spoken to precisely depicts the event of a health-related occasion over time and its distribution in the population by place and person. The information from a PHS scheme should accurately represent the features of the health-related cases under PHS to generalize results from PHS information to the population at large (5, 14).

Unwavering quality (i.e., the capacity to gather, oversee, and give information legitimately without disappointment), accessibility (i.e., the capacity to be operational when it is required) of the PHS framework. A need for committed assets might influence the solidness of a PHS. For illustration, workforce deficiencies can determine reliability and accessibility. However, the stable output is critical to the viability of the PHS scheme in any case of the health-related incident being tracked. An unreliable and unavailable monitoring scheme can delay or discourage the required PH action (12, 14).

5. Conclusions

The structure of the PHS information flow from Keble to Zone was well organized. However, coordination and supervision of the PHS activities were not frequent. From those supervised HFs, most of them are not receiving feedback. There was no budget line, written feedback, epidemic and preparedness, and response plan regular based on supportive supervision at all visited HFs. Therefore, this finding suggests the importance of PHS training for focal persons and strict follow-up of the implementation of the acceptable PHS system might improve PHEM capacity. Besides, minimizing the irrational case definition of diseases could also help to improve PHEM capacity.

Abbreviations

PHS: Public Health Surveillance, PH: Public Health, HO: Health Office, HC: Health Center, PV: Predictive Value, HP: Health Post, PHEM: Public Health Emergency Management.

Declarations

Consent to Participate: The support letter was taken from Debre Tabor University, College of Health Science, and then formal consent was taken from the selected zones. The purpose of the study was informed to the concerned body.

Consent to Publish: Not applicable

Availability of data and materials: All data generated and analyzed during this study are included in the manuscript.

Competing interests: The authors announced that they have no opposing interests.

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Authors' contribution

All authors are actively involved during the conception of research issues, development of research proposals, and writing of various parts of the research report. The final manuscript is prepared by Mr. Chalachew Yenew. All authors read and approved the final manuscript.

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Figures

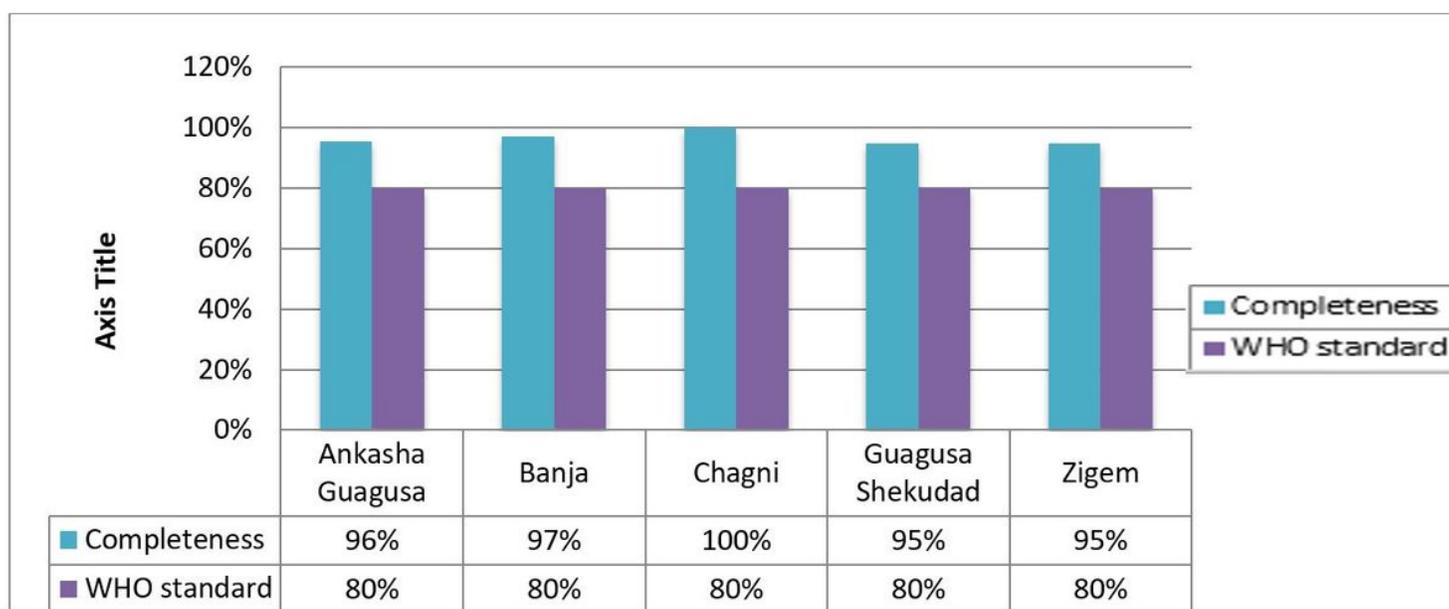


Figure 1

Timelines & completeness of Governmental Health Facility Awi Zone, Amhara Regional State, Ethiopia, 2020