Health Data Quality and Use in the Afar Region of Ethiopia: Practical Challenges, Best Practices, Lessons Learned, and Recommendations

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Abstract

Background: Ethiopia has implemented a routine health information system to ensure the production and use of quality data across all healthcare levels. However, in many low-income countries, including Ethiopia, most Health Information Systems (HIS) provide data that inadequately influences decision-making. Pastoral regions, in particular, lag behind the national average in health service uptake. There is a lack of empirical evidence on existing approaches, challenges, and best practices for health data quality and information use in pastoral regions. This study focuses on exploring these aspects in the Afar region of Ethiopia.

Methods: A descriptive exploratory case study design was employed to conduct an in-depth exploration of existing challenges, best practices, lessons learned, and improvement strategies among eleven health institutions. Twenty-five purposively selected participants from the regional health bureau and local health facilities were involved. A semi-structured interview guide was used, and verbatim transcription and translation were performed. The translations were coded, and thematic analysis was conducted.

Results: This study identified three primary themes: challenges, best practices and lessons learned, and strategies and recommendations to overcome these challenges. Key challenges include poor data quality and assurance, ineffective data management and use for decision-making, low HIS capacity, a lack of professional motivation, and insufficient training and human resources. The best practices highlighted include peer-to-peer learning, performance-based recognition, regular performance review meetings, and experience sharing with a neighboring health facilities.

Conclusions: Significant challenges identified include data quality and assurance issues, ineffective data management and use, a lack of professional motivation, and a shortage of training. Collaboration among professionals, sharing experiences with nearby health facilities, regular performance reviews, and peer-to-peer learning are noted as effective practices. Therefore, sustaining the best practices, developing, and adapting training and governance documents, building capacity, advocating for improvement, holding review meetings, and continuously generating and adapting evidence are essential recommended strategies to improve health data quality and decision-making in the Afar region. [*Ethiop. J. Health Dev.* 2024; 38(SI-2)]

Keywords: health information system, best practices, challenges, Afar region, Ethiopia.

Background

The Health Information System (HIS) is crucial for enhancing healthcare quality (1, 2). The Routine Health Information System (RHIS) digitally manages health data collection, processing, reporting, and use (3, 4). Reliable and timely health data are vital for evidence-based decision-making and efficient resource allocation (4). Despite the implementation of RHIS in low-income countries like Ethiopia, poor data quality hampers effective decision-making and resource allocation, leading to suboptimal healthcare outcomes (5, 6).

Globally, stakeholders increasingly demand more effective measurement of data quality and utilization (3). In response, the Ethiopian Federal Ministry of Health (FMoH) has been implementing the Health Management Information System (HMIS) across all healthcare levels to ensure the production and use of quality data(7). By the end of 2013, approximately 98% of public hospitals and 87% of health centers in Ethiopia had adopted HMIS (8). To strengthen HMIS, the Ethiopian government introduced an information revolution agenda in the Health Sector Transformation Plan (HSTP), aimed at enhancing data collection, analysis, dissemination of quality data, and promoting the digitalization and governance of HIS (9).

The national transformation plan initiated various efforts to enhance HMIS data quality and use, including capacity-building training on data documentation and reporting (10), data collection, data analysis (11), data quality assurance (12), and guidance on informed decision-making by relevant stakeholders (13). In 2019, Ethiopia introduced the web-based District Health Information System Software version 2 (DHIS-2) nationwide, alongside efforts to improve internet connectivity in health facilities (14). Recent studies revealed that over 95% of health facilities use either the online or offline DHIS-2. Reporting rates via DHIS-2 vary by region, with 80% for disease reporting and 90% for health service reporting (15).

Previous studies in Ethiopia have shown that healthcare providers' use of HMIS data in their work ranges from 33% to 69% (16, 17). Additionally, around 52.7% of

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health professionals do not believe that data recording was their responsibility (14). Despite the Ethiopian government's efforts to improve data quality and use, the saturation remains poor. Challenges include a shortage of trained health workers, high staff turnover, limited data access, lack of data analysis skills, disinterest in data use, poor infrastructure, and insufficient political will (8, 11, 18, 19). Furthermore, issues with data completeness, consistency, relevance, non-user friendly nature of HMIS formats, and inadequate feedback from leaders hinder information utilization (20).

As a pastoral region in Ethiopia, Afar exhibits social indicators below the national average (21). Empirical evidence also indicates that health service uptake in Afar significantly lags behind the national level (22). A previous study found that health facilities in the Afar region have the lowest utilization of HMIS format reporting compared to facilities nationwide. This is primarily due to the region's rural and pastoral communities lacking basic infrastructure, such as reliable electricity and computers, which hinders the HMIS reporting process (23). Studies suggest that enhancing health workforce capacity, improving data access and infrastructure, incentivizing data use, and fostering political will in pastoral regions are key strategies to improve health data (7, 18). However, there is limited evidence on RHIS implementation in pastoral regions like Afar, with scarce data on current approaches, challenges, and best practices for ensuring quality health data and its use. This study aims to explore these aspects in the Afar region of Ethiopia.

Methods

Study setting and period

This study was conducted from May 15 to June 15, 2023, in Ethiopia's Afar region. The Afar region is one of Ethiopia's most agro-pastoralist regional states, covering an estimated area of 72,052.78 square kilometers. According to the Ethiopian Central Statistical Agency's 2012 report, Afar has an estimated total population of 1,945,801 with approximately 86.6% of the population being rural dwellers (24). The region comprises five city administrations, 37 districts, five zones, 7 hospitals, 96 health centers, and 338 health posts. The study included Awasi Rasu and Gabi Rasu zones, chosen for their accessibility, HMIS implementation, and participation in national initiatives. Data was collected from the Awash City Administration, the districts of Awash Fentale, Afambo, Elidar, and Dubti, and the capital, Semera, across eleven carefully selected healthcare facilities.

Study design

A descriptive exploratory case study design was employed to explore the phenomenon and context of the existing HIS interventions: implementation status, challenges, best practices, and lessons learned in the region. The research team adopted an interview guide from various literature sources and contextualized it to the pastoral setting.

Study population

The study population included selected program leaders and coordinators, HMIS case-team leaders, Health Information Technology (HIT) professionals, heads of health centers and hospital heads, PMT members, and district and HIS officers from district and regional health bureaus.

Sampling and data collection procedures

From eleven purposefully selected health institutions, 25 key informants were chosen from the Afar regional health bureau, district health offices, hospitals, and health centers. An English interview guide was developed through a literature review, focusing on current HIS intervention approaches, challenges to ensuring data quality and information use, and existing opportunities. Four experienced professionals with bachelor's degree conducted the qualitative interviews. They received half ad\ay training on how to collect data using an interview guide. The research team scheduled interviews at the participants' convenience, conducting all sessions face-to-face in their workplaces. All interviews were tape-recorded, and field notes were taken. The length of the in-depth interviews ranged from 30 minutes to 60 minutes, depending on the level of information saturation.

Data quality assurance

To ensure the study's trustworthiness, several techniques were employed. Participants directly involved in HIS implementation were recruited to share their experiences, challenges, and best practices. Interviews were conducted in a comfortable setting to encourage open responses. The study's purpose was explained to maintain participants' trust, and close supervision by the research team ensured data quality. Experienced data collectors and thorough probing were utilized to enhance credibility. A detailed description of the study context and participants ensured transferability, while documented procedures ensured dependability.

Data management and analysis

The analysis began concurrently with the data collection process, as successive probing questions were asked based on participants' responses. Verbatim transcription and translation of records into English were performed. The transcriptions were coded, and thematic analysis was performed using Open Code Software version 4.03. The emerging themes were grouped and summarized as HIS implementation challenges, lessons learned and best practices, and strategies and recommendations. To enhance understanding of the challenges, lessons learned, best practices, strategies, and recommendations related to HIS implementation, themes were supported by direct (verbatim) quotations. We also utilized the consolidated criteria for reporting qualitative studies in the presenting the study findings (25).

Result

Participant characteristics

Twenty-five key informants from 11 health institutions participated in the study. The participants had diverse experiences and represented the regional health bureau,

district health offices, hospitals, and health centers. Out of the 25 participants, 19 (76%) were male. Most participants had over ten years of work experience, and more than 55% were from health centers. The predominant participants in this research were HMIS officers and facility heads (Table 1).

Table 1: **Socio-demographic characteristics of study participants, Afar region, Ethiopia, 2023 (n = 25).**

No	Participant characteristics	Level	Frequency
1.	Age group (in years)	< 30	7
		30 – 35	8
		> 35	10
2.	Sex	Male	19
		Female	6
3.	Institution	Health centers	10
		Hospitals	6
		District health offices	7
		Regional health bureau	2
4.	Total years of experience (in years)	< 5	6
		5 – 10	9
		> 10	10
5.	Total years of experience in the current position (in years)	≤ 5	9
		> 5	16
6.	Position	HMIS officers	11
		M&E officer	4
		Plan officer	2
		Facility heads	8
7.	Level of education	MPH	4
		BSc	10
		Diploma	11
		Total	25

Main findings of the study

We summarized the study findings under three main themes: challenges, lessons learned and best practices, and strategies and recommendations, each containing multiple sub-themes.

HIS implementation challenges

This study identified several challenges hindering HIS implementation, including issues with data quality assurance, data management and analysis, decision-making based on data, HIS capacity, and professional motivation, and shortages in training, human resources, and infrastructure.

Data quality and assurance mechanism

Health Data Quality is central to monitoring health programs and making evidence-based decisions. However, most participants had limited knowledge and skills regarding data quality concepts and dimensions. A hospital plan officer remarked,

> *"We are simply collecting the reports but lack information about their quality and dimensions." (a 32-year-old, plan officer).*

Many participants were unfamiliar with standard data quality dimensions like completeness, timeliness, and consistency, as well as how to measure them. This knowledge gap was prevalent across health facilities and districts. A health center head stated,

> *"I didn't know about completeness, timeliness, and consistency, nor had prior experience with them" (a 35-year-old, Health Center Head).*

Despite being aware of Lot Quality Assurance Systems (LQAS) and Routine Data Quality Assessment (RDQA), there was minimal implementation of these mechanisms at the health facility and district levels. An HMIS officer from a health center stated,

> *"We cannot conduct LQA because we don't know how to apply it or the technical approaches." (a 30-year-old, HMIS officer from the health center).*

Data management, analysis and display

Effective data management, analysis, and display are crucial for making the data actionable. This study revealed significant challenges in this area, including limited knowledge and practice of data analysis and visualization among health workers. A 36 years old HMIS officer noted,

> *"We are simply calculating simple proportions but lack the skills to perform diverse analysis using Excel and display results." (a 36-year-old, HMIS officer).*

Another 29-years-old HMIS officer stated,

> *"We calculated some analyses manually and don't prepare informative reports for health professionals and decision-makers due to the skill gap." (a 29-year-old HMIS officer).*

Key informants across health facilities highlighted the absence of established data visualization practices, making data difficult to understand and use.

Use of data for decision-making

The primary purpose of generating quality health data is to support evidence-based decision-making at various levels of the healthcare system. The Performance Monitoring Team (PMT) plays a crucial role in this by analyzing data to improve data quality and care. However, our findings suggest that the PMT is ineffective in many facilities and districts of the Afar region, including the regional health bureau. Reasons include unclear PMT roles, infrequent meetings, and poor follow-up on action plans. Participants were often unclear about PMT roles, and some facilities lacked a defined PMT, leading to confusion about its purpose and responsibilities.

A 39-year-old, M&E officer from the regional health bureau noted,

> *"The PMT is not functional due to lack of awareness about its structure, roles, and responsibilities, and facility leadership is unaware of PMT duties." (a 39-year-old, M&E officer from the regional health bureau).*

Additionally, the PMT did not meet regularly, and meeting minutes were poorly maintained, hindering problem identification and action plan development. This lack of regular meetings and follow-up on action plans prevented improvements in data quality and care. A 38-year-old health center head explained,

> *"We are not aware of how to set agendas, address issues, or conduct PMT meetings. This leads to irregular and ineffective PMTs." (a 38-year-old, Health Center Head).*

HIS capacity and professional motivation

This study identified several challenges affecting the capacity and motivation of professionals in the health information system (HIS). Participants reported that many Health Information Technicians (HITs) lack the necessary knowledge and skills for HIS tasks such as data quality assurance, analysis, and display. Moreover, many HITs are unfamiliar with medical terminology, leading to data entry errors. A health center head noted:

> *"The skill of HITs in leading HIS activities is limited, preventing us from properly coaching other health professionals on data recording, analysis, and use" (a 35-year-old, Health Center Head).*

The study also found that health professionals have limited awareness of the importance of data and low motivation for HIS tasks. An HMIS officer stated,

> *"Health professionals value data poorly and are more committed to clinical care" (a 36-year-old, HMIS officer).*

Additionally, poor documentation by medical staff complicates data collection about patient care. A facility head explained,

> *"Health professionals are not motivated by data generation and do not understand its significance." (a 42-year-old, Health Center Head).*

Key informants stated low motivation and job satisfaction due to poor follow-up, inadequate leadership focus, lack of transportation to health facilities, and limited infrastructure. An HMIS officer stated,

> *"Lack of infrastructure, poor leadership attention, and weak follow-up are major challenges to health data management." (a 30-year-old, HMIS officer).*

Training, leadership accountability, human resources and infrastructure

This study found that many healthcare professionals have not received adequate training in data quality and usage. A hospital plan officer noted,

> *"Basic HMIS concepts, tools, and DHIS2-related training are not organized or provided." (a 31-year-old, plan officer).*

Those who had received training reported it was insufficient, with a District health office HMIS officer stating,

> *"Training approaches are too theoretical and don't address practical issues." (a 32-year-old, district HMIS officer).*

The study also highlighted a lack of attention to HIS from the Ministry of Health (MOH) and regional health bureaus, with inconsistent supervision and no HIS-focused mentorship strategies. A health center head commented,

> *"Monitoring HIS activities is inadequate, and supervision is irregular." (A 37-year-old, Health Center Head).*

Leadership and accountability issues further complicate HIS implementation. Some leaders lack commitment and fail to manage HIS effectively, which demotivates healthcare professionals. An HMIS officer explained,

> *"Poor leadership commitment to HIS activities demotivates other health professionals." (a 32-year-old, HMIS officer).*

The absence of accountability systems hampers the ability to address HIS errors and governance issues.

Human resource and infrastructure challenges are also significant. Many facilities in the Afar region lack essential infrastructure, such as computers, internet access, electricity, registers, and printers, which impacts data quality and management. An HMIS officer noted,

> *"Many facilities lack internet, computers, and other essential inputs for HIS activities." (a 34-year-old, HMIS officer).*

High staff and leadership turnover further disrupts HIS activities, as experienced staff leave and newcomers are unfamiliar with the systems. A health center head stated,

> *"Staff turnover affects HIS activities as oriented staff leave and newcomers need training." (a 33-year-old, Health Center Head).*

Best practices and lessons learned

Best practices and lessons are vital for successful Health Information System (HIS) implementation and can be scaled to similar settings. This study identified key practices to improve data quality and use, including collaboration among health and HIT professionals, sharing experiences with nearby institutions, regular performance reviews, performance-based recognition, and peer-to-peer learning. Effective collaboration enhances data accuracy by improving the understanding of medical terms and data reporting. An HMIS officer noted,

> *"We collaborate with clinical staff to share HIS-specific technical issues and medical terms, which enhances our HIS activities." (a 32-year-old, HMIS officer).*

Experience sharing with nearby health institutions has also proven to be an effective strategy. This can occur formally or informally, such as through visits or communication via phone calls and messaging apps. A 37-year-old M&E officer stated,

> *"Experience sharing helps us adopt successful HIS strategies from better-performing facilities." (a 37-year-old, M&E officer).*

Regular performance reviews help facilities identify gaps and develop improvement strategies, particularly in data quality. Performance-based recognition further motivates staff and improves HIS and overall health program performance. An M&E officer mentioned,

> *"Facilities that regularly review performance and apply performance-based recognition are models for others." (a 37-year-old, M&E officer).*

Lastly, peer-to-peer learning, especially after training, helps maintain HIS capacity despite high staff turnover. An HMIS officer explained,

> *"Due to low training opportunities and high turnover, some facilities use peer-to-peer learning to orient new staff using experienced personnel." (a 36-year-old, HMIS officer).*

Strategies and recommendations to overcome challenges

Based on the experiences shared by key informants during HIS program implementation, this study proposes several strategies and recommendations aimed at mitigating challenges and replicating successful HIS practices. Priority activities include developing tailored training materials, defining terms of reference for Performance Monitoring Teams, establishing local accountability guidelines for the HIS, and creating a framework to motivate local HIS efforts.

Additionally, the study identifies the need for leadership training and advocacy for HIS leaders, implementing mentorship programs, and setting up a robust monitoring and evaluation system for HIS. Experience sharing within and across health institutions, along with promoting local learning and research, is also recommended to inform effective HIS interventions.

The study emphasizes the importance of practice-based training aligned with the local context and on-site coaching through mentorship to address knowledge and skill gaps in HIS. Leadership and advocacy training for HIS leaders can enhance their commitment and understanding of HIS activities. Furthermore, establishing an HIS accountability framework and motivation guidelines is essential to addressing behavioral and attitudinal challenges within the HIS program implementation.

Discussion

This study explored the challenges, best practices, and lessons learned while providing recommendations to enhance health data quality production and use in Ethiopia's Afar region, highlighting the current state of health data in this agro-pastoral area.

HIS implementation challenges

The main challenges in HIS implementation for quality health data stem from weak data quality assurance mechanisms. Health professionals often lack knowledge and skills in key data quality dimensions like completeness timeliness, and consistency. This lack of awareness results in incomplete, untimely, and unreliable data, which impacts decision-making. Additionally, partial implementation of Lot Quality Assurance Systems (LQAS) and Routine Data Quality Assessments (RDQA) due to technical incompetence further undermines data quality assurance. Previous findings indicated that evidence-based decision-making is complex without mechanisms for producing and ensuring high-quality health data (20, 26-28). Others have highlighted the crucial role of maintaining data quality and implementing data quality assurance mechanisms in making informed decisions (29, 30).

Another challenge in generating quality health data is weak data management and presentation, often due to health workers' limited experience with data analysis tools like Excel. Additionally, the system lacked platforms for creating visually informative reports. Similar studies have identified poor health data quality as a result of inadequate data quality assessment, unclear roles and responsibilities, and ineffective organizational procedures for data management (31). To overcome these challenges and improve health data quality, the health system should establish clear data quality policies, implement appropriate software, and enhance health professional's skills through targeted training programs.

Poor data use for decision-making was a challenge for HIS implementation in the Afar region despite the presence of a Performance Monitoring Team (PMT). Issues included unclear PMT roles, infrequent meetings, the absence of structures in some facilities, and inadequate follow-up on action plans. These gaps led to ineffective problem identification, root cause analysis, and action plans, undermining data quality and utilization. Previous studies indicated that poor data quality often results in unreliable data that is used symbolically rather than practically (32).

The health system is focusing on data revolution to improve evidence-based decision-making. This study suggests enhancing the capacity of health professionals and PMT team members, providing continuous supportive supervision, and ensuring the effective structure and function of PMTs at the health facilities and regional health bureau in Afar. These steps will boost data utilization in decision-making and foster a culture of using quality health data.

This study found that low capacity and motivation among health professionals are major challenges to HIS implementation in the Afar region. Key issues include insufficient technical skills, lack of interest in HIS tasks, and unfamiliarity with medical terms among Health Information Technicians (HITs), leading to data entry errors and low confidence. Medical staff also demonstrates limited awareness of the importance of health data and often fail to document patient history properly. Poor follow-up, leadership issues, transportation challenges, and inadequate infrastructure further reduce motivation and job satisfaction, with health workers prioritizing clinical duties over HMIS activities (14).

Moreover previous studies showed that staff motivation and perception of HIS service packages significantly impact data quality (33-35). This suggests that policymakers need to address staff performance, enhance capacity building, and boost health professionals' motivation to improve health data quality and its use in routine HIS.

In the Afar region, key challenges include staff shortages, high turnover, inadequate training, and limited infrastructure. An effective HIS program requires sufficient staffing, training, supportive supervision, and mentorship to address these issues and close skill and knowledge gaps. Additionally, inadequate follow-up from the Ministry of Health and the Regional Health Bureau has been noted. These findings align with studies from Benin and Uganda, highlighting that resource availability and supervision are crucial in ensuring health data quality and overcoming barriers like infrastructure limitations, staff shortages, logistical challenges, and inadequate office equipment for HMIS implementation and quality health data generation (34).

This study found that data quality and utilization challenges stem from leadership and accountability issues. Key informants reported that some leaders demonstrate a lack of commitment and responsibility, particularly in managing health information systems. This lack of leadership attention results in ineffective data use for decision-making and demotivates health providers, aligning with previous studies in Ethiopia (36-38). Scholars suggest that health data ownership and accountability are vital for effective data governance. Such practices ensure data quality, security, and compliance, fostering an organizational environment conducive to informed decision-making, maintaining data integrity, and adhering to regulatory requirements (39). This implies that leader engagement is essential for generating high-quality health data and ensuring its use. Leaders should allocate resources and foster a culture of accountability by monitoring healthcare providers' performance.

Best practice and lessons learned

This study identified key best practices for improving health data quality in facilities: fostering collaboration among health providers and HIT professionals, sharing experiences between nearby health facilities, conducting regular performance reviews, providing recognition and motivation, and establishing peer-to-peer learning forums. Collaboration among health and HIT professionals, particularly in the Afar region, enhances awareness of each other's expertise and improves decision-making, as noted in similar studies (40). Such Collaboration also improves resource utilization and reduces costs. Sharing knowledge with nearby facilities is valuable, providing opportunities to learn from each other's experiences. Empirical evidence supports the notion that experience-sharing is crucial for gaining knowledge, skills, and insights that enhance HIS implementation (41).

Similarly, this study found regular performance reviews are highly effective in some healthcare facilities, improving communication and fostering a culture of continuous feedback. Previous studies in Ethiopia's Sidama region also demonstrated that regular performance reviews positively impact the quality of health data production and use (42). Additionally, continuous monitoring of system performance helps quickly identify and address bottlenecks, preventing them from affecting health outcomes (43).

Moreover, this study highlighted performance-based recognition and motivation as a central practices and lesson. Literature from Ethiopia and Botswana supports the idea that such recognition and motivation significantly enhance the quality of health data production and use (44, 45). Peer-to-peer learning was identified as a key practice in the Afar region, where sharing knowledge and experiences promotes widespread learning within health institutions (46). Furthermore, peer-to-peer learning boosts information retention, staff motivation, and overall learning experiences. It also helps to develop communication and problem-solving skills. Promoting and advocating for peer-to-peer learning forums within health institutions can improve the generation and use of high-quality health data.

Strengths and Limitations

This study examined the multiple components of the health system, from the regional health bureau to the local health centers, regarding their involvement in Health Information Systems (HIS) implementation. It represents the first empirical evidence exploring the challenges, best practices, and lessons learned in HIS implementation in the Afar region of Ethiopia. The findings offer potential applicability to other pastoral regions and context-specific factors. However, the study's limitations include the exclusion of facilities affected by recent conflicts, which could have exacerbated challenges or highlighted additional best practices. Additionally, using both Amharic and English during interviews may present limitations,

given that Afarigna is the primary language spoken in the region.

Conclusion

This study has provided valuable insights into the current approach, challenges, and best practices of health data quality and use in the Afar region of Ethiopia. It proposes strategies for improvement, highlighting significant challenges such as insufficient accountability and commitment among professionals and leaders, inadequate follow-up, supportive supervision and mentorship, limited capacity in HIS, and high staff turnover. Moreover, the study identifies best practices and lessons learned, including regular performance meetings, collaboration among HITs and health professionals, and peer-to-peer learning and experience sharing.

Declarations

Ethical Approval and consent to participate: Ethical clearance was obtained from the Institutional Review Board (IRB) of the College of Medicine and Health Sciences, Hawassa University with ethical approval reference number (IRB/13/3). Support letter was obtained from Afar Regional Health Bureau and verbal informed consent was taken from each study participant. All data were collected using codes instead of mentioning the names of the respondents to avoid indication of any personal characteristics. No compensation and incentives were provided to the study participants beyond expressions of appreciation. All participant data was stored anonymously and in accordance with the 1964 Declaration of Helsinki.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used during the current study are available from the corresponding author on a reasonable request.

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