Exploring the barriers and facilitators of training as well as post-training follow-up interventions to enhance data quality and utilization: Utilizing the CFIR Implementation Framework

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Abstract

Introduction: Despite significant investments have been made in improving data quality and information utilization, progress in this area continues to lag behind the target set by the government of Ethiopia. Data incompleteness and inaccurate reporting remain major challenges of the healthcare system. While capacity building for healthcare system leaders is recommended as a solution to enhance the production and use of quality health data, existing evidence suggests that poor health data production and utilization continue to impede effective health system planning and decision-making. Consequently, this study aims to explore the facilitators and barriers of training and post training follow up intervention aimed at enhance health data quality and utilization at Benishangul regional state.

Objective: The aim of the study is to explore the barriers and facilitators of training and post-training follow-up intervention through capacitating health system leaders to enhance health data quality and use.

Methods: A phenomenological study was conducted among 11 participants from multiple sites. In-depth interviews was conducted to explore the barriers and facilitators of training and post training follow up intervention. The data were collected throughout the entire process starting from the initiation of the implementation. The interview guide was adapted from the consolidated framework for implementation research (CFIR), and after transcribing and translating the data, the Open code version 4.03 was used to code and analyse them thematically. The results were presented under the CFIR domain and its framed constructs, along with quotations of participants' sayings.

Results: The findings showed that, based on the intervention characteristics, positive staff attitude, and the existence of regular performance monitoring team meetings, regular feedback mechanisms, and health system leaders' engagement were facilitators of the intervention. However, staff resistance, political instability, and workload challenged the implementation.

From an outer-setting perspective, the policy initiative to engage health system leaders was mentioned as a implementation facilitator. On the other hand, limited awareness among staff regarding intervention packages and communication, lack of resources, and frequent campaign activities acted as barriers to implementation. Regarding the inner setting, implementers who were young showed interest in the intervention package and easily adapted to it. However, the implementation was constrained by the lack of peer-to-peer support, a poor culture of valuing health data, expectations of extensive trainings, and a shortage of trained personnel.

In terms of the individual's characteristics, low beliefs and perceptions towards the intervention during the initial phase were barriers to implementation. However, health staff gradually accepted the intervention and began delivering it themselves.

Lastly, the presence of a clear plan, leaders' involvement, evaluation, and monitoring of activities facilitated the implementation. However, the implementation schedule was not strictly followed as per the protocol due to political instability in the region.

Conclusion: The barriers and facilitators identified can be modified during the study. By providing the capacity building training and post training follow-up intervention to the health system is paramount to enhance data quality and utilization. Focusing on the barriers and facilitators identified in this study could help to improve health data quality and utilization through proper design of strategies and scaling up its effectiveness to larger settings where a similar contextual environment with the current study could enhance better data quality production and use. [*Ethiop. J. Health Dev.* 2023;37 (SI-1)]

Keywords: Barriers, facilitators, intervention, implementation, CFIR, framework, Benishangul Gumz, Ethiopia

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Introduction

Strengthening the health system through improved health data and use is one of the top prime areas in the healthcare system (1). It is believed that quality healthcare and improved health status of the population depend on the level of quality health data generated and used for healthcare planning and decision-making (2). The poor health data leads to poor health service provision and affects the community's health conditions (2). As one of the building blocks, a health information system (HIS) is an identified area to bring better health through quality health data production and use (3). The HIS is a foundation of the health system along with other health system building blocks to leverage better decision-making for improved health conditions (4).

To limit the global public health challenges related to poor data production and use, it is recommended to make emphasis on attaining optimal health data quality and use to bring a strong health system (5).

The government of Ethiopia has been working to enhance health data quality and use for the last several decades aiming to improve the health status of its population. A series of interventions have been implemented to transform the culture of health data production and use for the improvement of the healthcare system and targeted as the key area of the health sector transformation agenda (6). Despite significant commitment made to improve the health system in Ethiopia, poor health data production use, and evidence-based decision-making remained constraints of the health system in the country (7) and the national figures on key indicators extracted from the lower health system are subjected to errors (8).

Health system leaders use HIS data for planning and decision-making (5) and it is critical to engage health system leaders in improving health system data quality and use (9). The leaders at all levels are expected to take accountability and ownership to regulate quality health data production and use for healthcare decision-making (10). According to the previous study, the health data quality and use level was reported as low in the district of Assosa city administration (11).

A research team at the University of Gondar (UoG) in collaboration with the regional health bureau (RHB), the Federal Ministry of Health (FMoH), and other partners designed an intervention to improve health data quality and use in Benishangul Gumuz regional state through the provision of HIS specific leadership training and post-training follow up intervention (TPF). Existing evidence revealed that leadership training positively impacts healthcare facilities' performance (10). Moreover, TPF showed significant contributions to the performance of the institutions (12-14). Though numerous hypotheses were speculated TPF could influence the efficiency and productivity of health system leaders, there is no conclusive and consistent evidence showing that TPF brings improvement in data quality and utilization. Therefore, the study aimed to explore the barriers and facilitators of TPF intervention to improve data quality and use. Likewise, the study utilized the CFIR implementation research framework to explore barriers and facilitators of TPF in Benishangul Gumuz regional state of Ethiopia.

Methods

Study design and period

A phenomenological qualitative study design was utilized to capture the lived experiences of health workers and health system leaders in the Benishangul Gumuz Regional State, specifically in the Assosa City Administration. In-depth interviews were conducted to explore the barriers and facilitators of TPF intervention in generating high-quality health data and its utilization. The study was carried out from October 2020 to July 2021.

Study setting

The study aimed to investigate the barriers and facilitators of implementing the TPF intervention to enhance the level of data quality and utilization. It was conducted in Assosa City Administration, which serves as the capital of Benishangul Gumuz Regional State in Ethiopia. Assosa city is estimated to have a population of 36,287 people in 2020, with males accounting for 18,035 and for females at 18,251. His city comprises ten urban kebeles and one rural kebele. The healthcare system in Assosa city includes one general hospital, two health centers, and ten health posts that offer preventive, primitive, and curative health services. The health workforce consists of 22 health extension workers, 146 health workers, and 52 support employees.

Sampling and recruitment

The purpose of this study was to evaluate the extent of data quality and utilization throughout the entire training period and post training follow up phase, starting from the proposal's inception to the conclusion of the data collection. The study aimed to identify the challenges and factors that influenced the implementation process by interviewing eleven key informants, including health facility directors, planning officers, Case-team coordinators, and HMIS officers. These individuals were selected for the study based on their exposure to the barriers and facilitators of the TPF intervention. They were invited to participate in the study through in-depth interviews, during which they were asked about their personal experience regarding about the barriers and facilitators of intervening with TPF to improve data quality and information utilization. The total number of participants was determined when information saturation was reached or when the information they shared with us became redundant.

Data collection and procedures

This study obtained information from various sources, including departments, heads of facilities, HMIS officers, and planning officers. The barriers and facilitators of the intervention were investigated throughout the entire intervention period.

The research team have involved to exploring facilitators and barriers of the intervention throughout the entire process. This includes activities during

training, post training follow-up, telephone call, mentoring, coaching, and supervision periods. Ultimately, the barriers and facilitators were investigated from key informants selected purposively to point out the potential enablers and facilitators of the intervention. In-depth interviews were conducted by two experienced interviewers who collected qualitative data to determine the barriers and facilitators of the intervention.

The interviewees were asked to provide feedback onthe barriers and facilitators they experienced during the implementation process of quality data generation and utilization. They were given an open-ended interview guideline written in Amharic, which included questions about the five interconnected elements of the implementation process:outer settings, inner settings, individual characteristics, intervention, and the implementation process itself. Through these questions, participants were encouraged to reflect on the barriers and facilitators in implementing TPF to enhance data quality and information utilization.

The interviews were conducted in areas where the interviewees felt comfortable, to ensensuring ure confidentiality, data quality, and the abilityto discuss sensitive issues. All of the interviews were recorded for accuracy. We provided the transcription to the first four participants to validate their trustworthiness. To establish credibility, we employed triangulation, comparing the responses of the different participants. Detailed description of the data and procedures were included to enhance the generalizability of the study's findings.

Data Processing and Analysis

Analysis began concurrently with the data gathering procedure, involving repeated probing questions based on the participants' responses. The data was transcribed and translated into English before being coded and thematically grouped using the Opencode-4.03 software. Thematic analysis was employed to analyse the data, with each phrase or statement being classified based on the concept it conveyed. The codes were then categorized, summarized, and tallied according to pre-defined themes in the CFIR framework. To enhance the reader's comprehension of the barriers and facilitators and their impact on data quality and utilization, the results section includes examples of direct (verbatim) quotations accompanied by the corresponding topics.

Results

Our study utilized TPF, mentorship and coaching during the implementation process. Moreover, virtual meetings, phone calls and supervision were utilized in addition to the physical support and mentorship. In this study, a total of 11 key informants were interviewed to explore the barriers and facilitators of TPF for health leaders in improving data quality and information use. The majority of staff who participated in this interview had 5 to 10 years of work experience and a minimum of diploma-level education (Table 1).

Table 1. **Socio-demographic characteristics of the study participants**

Participants' description	Frequency (n)	Percent (%)
Sex		
Male	9	82
Female	2	18
Age		
≤30	7	63.6
31-35	2	18.2
36+	2	18.2
Educational status		
Diploma	3	27.3
Degree	6	54.5
Masters and above	2	18.2
Work experience(years)		
<5	4	36.4
5-10	6	54.5
10+	1	9.1
Current position		

HMIS officer	3	27.3
Case-team/unit coordinator	4	36.3
M&E officer	2	18.2
Facility head/manager	2	18.2
Work area		
Health center	3	27.3
Hospital	3	27.3
District health office	3	27.3
Regional health bureau	2	18.1

Barriers and facilitators of TFP intervention for data quality and information use

We have utilized the CFIR framework to categorize our findings into intervention characteristics, outer-setting, inner-setting, individual characteristics, and implementation process. Furthermore, we have investigated the barriers and facilitators associated with adopting and implementing TPF on data quality and information usage.

Theme 1: Intervention characteristics

The intervention characteristics were the common narrative among key informants on the barriers and facilitators of the TPF for leaders to improve data quality and information use. The intervention characteristics refer to the aspects of an intervention that may impact implementation success. Four sub-themes were identified to describe the intervention. These sub-themes include source, relative advantage, adaptability, and complexity, and they emerged from the interviews.

Intervention source

Most of the respondents believed that the University of Gondar externally introduced the intervention in collaboration with the Benishangul regional health bureau. A typical response from [Town health office regulatory director with 6 years of experience]:

> "*The health system leadership and governance intervention were introduced by the Benishangul-Gumuz regional health bureau in collaboration with the University of Gondar.*" The inclusion of local institutions promoted shared understanding and contributed to the adoption of intervention packages.

He added how the source of the intervention was bundled after the gap assessment, along with the possibility to identify and modify the intervention components by explaining:

> "*The intervention was implemented by an external body, the University of Gondar. First, they took time to identify our gaps and accordingly implemented the intervention based on the identified gap. It was a good opportunity to us to identify our gaps working with them and identifying and modifying working strategies during the implementation."*

Relative advantage

The implementers expressed that the intervention has influenced the improvement of evidence-based decision making. A respondent [Town health department head, with 3 years of experiences] confirmed the finding by saying:

> "*As a leader, I got significant benefits to lead my organization to make evidence-based decision making as well as my holistic leadership skills was improved.*"

The study revealed that there wereas gaps in monitoring and regular feedback mechanisms in HIS before the implementation of the intervention. A respondent [RH Case team leader with 9 years of experiences] assured the finding by saying:

> "*There is no case team level performance monitoring and health care providers have no awareness and knowledge about HIS data quality and use and not done as per the standard. However, after the implementation, the performance monitoring team monitors HF performance regularly and the case team level performance monitoring was initiated. We observed that HIS monitoring and feedback mechanisms were improved."*

A respondent [HMIS officer with 6 years of experiences] assured the advantage of training and post training follow up for HIS improvement, he confidently claimed:

> "*Before the intervention, there was no performance monitoring system in our facility, data is not used for decision making purpose, data quality assurance was not conducted, feedback is not given for lower case teams. After the intervention, there was a great change in HIS performances. The performance monitoring team was established and monitors the facility performance monthly. Now Assuring data quality and use is every body's responsibility."*

Moreover, the intervention has contributed to changing the culture of health system data management practice.

A respondent [HMIS officer with 3 years of experiences] forwarded his feeling saying:

> "*The health center's current performance is the intervention's outcome. Previously, the responsibility of the data collection, report compiling, and analysis of the health center data was only for HITs. Now the culture and the responsibility also changed thanks for the initiative of this project."*

Furthermore, the intervention has contributed to improving the health workers' perception towards producing quality health data and use. In this view, a respondent [Hospital Manager with 4 years of experiences] explained:

> *"Prior to the intervention, the staff and management of the hospital had a low level of perception and knowledge on data quality and use. But now, the UoG has provided us appropriate trainings and post training follow up and valuing health data for decision making was improved."*

Adaptability

The leadership and governance intervention of the health system can be readily customized and improved to address the issue of data quality and utilization. According to participants, the implementation of this intervention was found to be easy and straightforward. A typical response from a, [RH case team leader with 9 years of experiences]:

> "*The unique characteristics of this intervention were easy and simpler to implement than other initiatives. It focuses on quality rather than quantity and it works up to the ground for improvement."*

The engagement of the local stakeholders facilitates the adaptability of the initiative. According to a respondent [Regional M&E officer with 5 years of experiences] noted that:

> "*Our engagement will help to monitor the intervention with ownership and to implement the initiative successfully."*

However, respondents do not want to change the intervention characteristics. One of the respondents [HMIS officer with 6 years of experiences] responded as:

> "*The characteristics of the intervention were feasible to be implemented. The intervention was easy to implement. The activities were easy to follow as well as to measure. The intervention was feasible in terms of time.*"

It has been mentioned that the intervention must be integrated with the health system plan to enhance the capacity of the health workforce and bring about significant improvements. One of the respondents [HMIS officer, 6 years of experiences] justified this by expressing his opinion:

> *"The UoG was leading the intervention, but for future the districts should take the lead or ownership for sustainability and to resolve challenges within the facility efforts."*

Another respondent [Emergency service director, 4 years experiences] added:

> *"I believe the intervention positively impacts health data quality and use. Now we have a common sense related to data collection and management system. It is better to cascade the intervention with facility plan to enhance the role of managers on HIS."*

Complexity

The implementation of the health system's leadership and governance intervention faced challenges in terms of time, boundaries, and performance measures by both the organization and individuals. The timing of the intervention, specifically during the campaign time and the frequency of the intervention, posed significant challenges to the implementation process. According to the [HMIS officer with 3 years of experience], the challenges related to program organisation and external factors can be explained as follows:

> "*The first thing that may challenge the implementation of the intervention is the interruption of the schedule and irregularity in the follow-up of the mentorship program."*

The finding indicated that the healthcare providers initially resisted the intervention but gradually accepted it. Moreover, the study found that healthcare providers perceived difficulty integrating the intervention into their routine activities while effectively managing health system data. One of the respondents [HMIS officer, 6 years experiences] explained as:

> *"Initially staffs especially general practitioners resisted the intervention because they perceived that data quality and use is not their responsibility rather, they are responsible only patient care. Gradually they believed as the intervention is important to improve patient care."*

Theme 2: Outer settings

The outer setting influences the implementation of the health system's leadership and governance intervention both positively and negatively. The major areas identified as part of the outer setting for the training and post-training follow-up intervention were facility needs, cosmopolitanism, peer pressure, external policy, and incentives.

Facility needs and resources

The health facilities had a gap in the health information system and needed intervention improve the data quality and information use. There were gap in data quality, evidence-based decision-making practice, poor knowledge and awareness among staff, and low management support from the health facility. One of the interviewers [RH case team with 9 years of experience] typically explained their facility needs as:

> "*Before the implementation of the intervention, there were gaps in data quality and information use like the health center did not monitor its performance regularly; there was no case team level performance*

monitoring; healthcare providers had no awareness and knowledge about HIS…"

On top of the gaps in the health information system, there was a resource limitation that hindered effectively support for health information systems. One of the case team leaders [Case team coordinator with 9 years of experiences] explained the resource limitation for the health information system as:

"*The local government has low attention for HIS in terms of securing budget, monitoring and evaluating HIS performance, supportive supervision, mentorship, and feedback, which will affect our HIS performance…"*

Cosmopolitanism

The health facilities in Assosa district have limited networking with both external governmental or non-governmental organizations.

The study found that the intervention district has no formal networking with other health sectors regarding data quality and use. However, the intervention has impacted the formation of networking among facilities. One of the respondents [RH case team leader with 9 years of experience] justified the finding as follows:

"Before the intervention, there was no formal communication between us and Assosa hospital and communication with Assosa town woreda health office was very loose. Thanks to UoG, our connection was improved after introducing this intervention."

Supporting the idea, a respondent [HMIS officer with 6 years of experiences] added:

"Before the intervention, there was no integration; after we started to implement the intervention, we planned how to ork with different stakeholders, especially relatedto data quality and use."

Moreover, due to the absence of formal communication in the district, there was limited communication of stakeholders. However, the intervention has brought working together with active communication. A respondent [Town health department head with 3 years of experience] reaffirmed this finding by saying as:

"Before the intervention, we did not evaluate the performance of stakeholder, even some stakeholders bypassed directly to HFs without informing us. However, after receiving the trainings and identifying our gaps, we monitored and engaged stakeholders and had a good networking with stakeholders. This was the result of the intervention."

Peer pressure

The competitive pressure to implement the health system's leadership and governance intervention was one of the outer setting factors that affected the program's implementation. The participants were asked about other prioritized agendas or programs in the district that could affect the intervention.

The finding indicated that the presence of campaign or field activities were competing the intervention. A respondent [regional M and E officer with 3 years of experiences] justified the finding as:

"*During campaign, especially community-based health insurance, some health workers are out of health facilities and health workers who remain at HF for routine health activities face work overload. Thus, they also not have time for data recording and reporting."*

Considering that, a respondent explained that the campaign related to the COVID-19 pandemic has influenced the intervention. The leaders considered it a prioritized agenda during the implementation. One of the respondents [HMIS officer with 6 years of experiences] justified the finding as follows:

"S*ometimes the introduction of new hospital initiatives and campaigns like COVID-19 vaccination campaign affects the intervention in some extent."*

External policies and incentives

It is an external strategy to spread the health system's leadership and governance intervention of the health system, which includes policies and regulations that could affect the potentially impact the implementation. The current health policy of Ethiopia is supportive of this initiative, as information transformation align with one of the agendas of the Ministry of Health. One of the respondents [Hospital manager with 17 years of experience] described the external policy related to the intervention as follows:

"*One of the four major agendas set by the Ministry of Health at the national level is the information revolution. This agenda helps to improve the quality of decision-making by improving the quality and utilization of data. Therefore, since the TPF intervention operates on data quality and use, the guidelines obtained from the Ministry of Health fully support it." Despite staff motivation being a recommended approach as it is an individual related factor that can create the competitive work environment, the implementers did not get the incentive concerning data quality and use.*

Another respondent [RH case team leader with 9 years of experiences] added his feelings saying:

"Some stakeholders secure incentives for health workers to implement their initiative, but we did not get incentive during TPF intervention. This was also a challenge to the implementation."

Theme 3: Inner settings

The inner setting of the health facilities influences the implementation of the health system's leadership and governance intervention. The structural characteristics of the health facilities, network and communication within the organization, organizational culture, and implementation climate were the major areas affecting the training and post-training follow-up intervention.

Structural Characteristics

The social architecture, age, maturity, and size of an organization in Assosa district ve positively and

negatively influenced the intervention's implementation.

The majority of the health professionals are young, which is believed to be productive and willing to implement the intervention. The monitoring and evaluation expert explained the structural characteristics of the healthcare staff. A respondent [M and E officer with 9 years of experiences] explained as the health staffs with young age are more productive and can easily capture and adopt the intervention by saying:

"*Most of the hospital staff, team leaders, and directors are young and productive."*

The finding also showed that the maturity of health professionals, particularly in the lower parts of the health system, act as a barrier to the implementation of the intervention. A respondent [HMIS officer with 6 years of experience] raised his concern as*:*

"*... staff maturity has a great influence. What frustrates us is the professionals' capability at the health center level. The personnel at the hospital level are mature and can do their activities independently."*

Furthermore, the study revealed that staff motivation at the intervention district has influenced the implementation. A respondent [HMIS officer, 29 years experiences] described the finding as follows:

"Healthcare workers are not motivated. Health facility and district heads were not assigned by RHB rather by the ruling local party which cause trained staff turnover and affects sustainability issue."

In the study district, the limited number of trained professionals has posed a significant challenge for implementation. A respondent [HMIS officer with 29 years of experiences] confirmed this finding saying:

"Perhaps there are places where HITs are not available, and they may need HIT from a digitalization aspect. For instance, if Assosa hospital wants to start EMR, they need IT professionals to support them.

Moreover, the existence of reluctant health workers at the intervention district for data quality and use was a challenge. One of the respondents [Emergency service directorate director with 4 years of experiences] explained his feeling as:

"Previously, as medical doctors and including myself, we were reluctant to trust the quality of the data and its usefulness in providing information. I think this is the problem of preservice training during our study. That is why this intervention gives me a sense of ownership and problem-solving technique using the available data and evidence. I personally benefited from the intervention."

In addition, the study showed that health staff externalize health data recording, reporting, and utilization, attributing these task to health information technicians. One of the respondents [HMIS officer with 29 years of experiences] described the finding as follows:

"They externalize the responsibility of recording activities for other staff. They perceive the recording activities are the responsibility/tasks/ of the HITs."

Communications

Before the implementation of the intervention, communication was limited within the health facilities. However, after the intervention, communication (both formal and informal) between the departments improved. One of the respondents [HMIS officer, 3 years' experience] noted that:

"*The communication among the staff and the management teams is less good and mostly formal communication. After the intervention, the communication enhanced the communication. We have a chance to get the leaders and can solve our challenges with discussion."*

The feedback system also became functional, and the feedback was communicated in a timely manner to aid in decision-making. Furthermore, in addition to formal communication channels, social media platforms like Telegram were established to facilitate seamless communication across departments.

Culture

The norms, values, and basic assumptions of the Woreda Health Office, facilities, and health workers towards the health system's leadership and governance intervention were explored. Before the intervention, there was a poor culture surrounding data quality and information use. The data was collected and sent to higher hierarchies solely for the reporting purpose, as required by higher officials. Furthermore, decisions were made without proper evidence. One of the respondents [Case team coordinator, 4 years of experiences] explained:

"*Before health system leadership and governance intervention was implemented, we made decisions blindly without using data, and this was also true for health facilities in our town.*"

The culture of data quality and use has undergone a significant change following the intervention. As a result, many health professionals now consider it their responsibility to ensure the quality of health data and its utilization. One of the respondents [Case team coordinator with 4 years of experience] from the maternal and child health department forwarded that:

"*As we know, the organizational culture for the data is totally different to before the training of the intervention and has now changed the minds of most staff. Thanks to the University of Gondar."*

Implementation climate

The absorptive capacity for change and the shared receptivity of involved individuals to the health system's leadership and governance intervention were explored. However, the intervention faced resistance

from the health providers and management staff due to a conflict of interest. A respondent [M and E officer with 9 years of experiences] explained the implementation climate as:

> "*Most staff, including senior management team members, resist health system leadership and governance intervention because before this intervention, no other intervention was implemented to improve data quality and use. They think the intervention should be carried out by those staff who received HIS leadership training."*

Furthermore, most of the staff believed that the intervention required additional training on health information systems. However, the intervention was primarily focused on improving leadership and governance of the health information system rather than providing intensive training for health professionals. The health providers were eager to implement the initiative and willing to work closely with the health facility management and experts from the University of Gondar. One of the respondents [Assosa Town health department head with 3 years of experiences] described as:

> *"Before the intervention, we have not received leadership training especially related with data quality and use. However, after University of Gondar provided health system leadership and governance training, we acquired leadership skills. Despite this, some staffs had resisted the intervention due to the fear of being unable to implement it without additional HIS training. Factors such as staffs attitude and motivation related were also influential in this regard.."*

Another respondent [Regional M and E officer with 5 years of experiences] supported the finding as follows:

> *"Initially, most staff resisted the intervention, believing that additional training was necessary for its implementation. However, most of them gradually accepted the intervention through mentoring, staff discussions, and feedback provision. Furthermore, despite all our efforts, we have established accountability for those who continue to resist."*

Theme 4: Individual characteristics

The findings indicated that there was good interaction between individuals and the organizations within which they work. Understanding how that interaction influences behavioural change at the individual and organizational level is crucial for the implementation of training and post-training follow-up for health leaders. Informants explored their beliefs , knowledge, change stage, and self-efficacy towards data quality improvement and information use after the training and post-training follow up.

Knowledge and beliefs about TPF

We found that the knowledge and beliefs of health leaders regarding training and post-training follow-up for the intervention were changed after its implementation. The intervention has made significant contributions to leaders' understanding of data quality improvement and the utilization of information for decision-making. A respondent [HMIS officer, 29 years experiences] mentioned the finding as:

> *"Initially, there was resistance to the intervention by some leaders. After training, a common understanding of lea As a result, good leadership engagement has been observed during implementation."*

And, the respondent [Case team coordinator with 9 years of experience] justified his view on the knowledge change about the training and post-training follow-up.

> *"...as a case team leader, I have been conducting internal mentorship weekly to identify the gaps and strengths within the case team."*

We found that the training on data quality and information use, along with the follow up given to leaders after training, resulted in a substantial improvement in beliefs and knowledge regarding these areas. This, in turn, enhances their decision-making skills. One of the facility heads supported this finding by adding:

> "*Some individuals resist the intervention at the very beginning. They resisted due to their attitude and personal behaviors towards the health system and governance intervention"* [Town health department head with 3 years of experience].

The finding indicated that individual beliefs related to the work environment and culture. This idea is supported by one of the HMIS officer's view:

> "… *The individual belief may relate to their work environment and culture. I think this individual belief and practice also influence the implementation of leadership and governance. As usual, when the training and follow-up are delivered according to the plan, the behavioural change of each individual is initiated to change their behaviours for the health systems' leadership and governance."[*HMIS officer, 3 years' experience].

The finding showed that individuals believe in their own capabilities to execute courses of action to achieve implementation goals. Individual belief and practice of these capabilities also influence the implementation of leadership and governance interventions. Moreover, an individual's capability to perform their work effectively is dependent on their knowledge, experience, and technical skills. Consequently, the outcome of the intervention may rely on individual behaviours.

Individual stage of change towards TPF

The improvement of data quality and information use at the individual level took time and was influenced by various factors such as the individual's work experience, behaviour, skills, and organizational culture. Furthermore, the attitude, motivation,

skills, commitment, and organizational position of staff have a significant impact on data quality improvements and information use among health leaders. Some of the employees with a good attitude, better skills, and organizational culture had better data quality and information use. This finding is supported by one of the participants' views:

> "*Change by itself needs a stage and process." The acceptability of the program also varies according to their knowledge and experience. After different intervention and close follow-up of the supervision, this belief and attitude might be changed and finally the organizational culture to good data quality and information use practice is improved*" [Case-team coordinator, 4 years' experience].

A respondent [Emergency director with 4 years of experiences] explained the individual stage of change towards health system's leadership and governance intervention target as follows:

> *"Change by itself needs a stage. Since the intervention is new for some staffs, it needs clarification and a change management process. So, in the previous period some staff were negligent to their work related to data recording and reporting activities. After the TPF, the belief and attitude were changed for good culture of data quality and information use practice."*

The findings highlighted that initiating the intervention following the successful implementation of CBMP and equipping these leaders/high-level decision makers with TPF has resulted in a noteworthy improvement in data quality and information utilization. This is primarily due to these leaders' influential role in shaping their employees' knowledge and beliefs, which serve as key enablers for the intervention's effectiveness. One of the participants expressed these facilitators as crucial for enhancing the implementation of the intervention:

> *"Compared to the previous data quality and usage, the change of individual's towards implementing the leadership management and governance intervention is significant"* [Town health office regulatory director, 6 years experiences.]

Moreover, after the intervention, it was found that having good awareness among staff about data quality and information use was also the facilitator for implementing the TPF. The idea was supported by one of the participants' [Hospital manager, 17 years experiences] opinion:

> "*It is a good thing that the employee can perform tasks on their own, as there was a good awareness among the staff about the intervention, and we are closely monitoring and assisting our employees.*"

Theme 5: Process

Planning

The findings demonstrate that the intervention has a well-defined strategy for raising leaders' awareness about its objectives. Additionally, the quality of data and utilization of information play crucial roles in achieving the intervention's goals. This finding was supported by the participant's [RH case team leader with 9 years of experiences] view:

> *"The intervention had a clear plan. Both basic and refreshment training were provided, and Assosa Woreda Health Office and University of Gondar regularly gave mentorship and feedback. I believe the intervention helped us improve our performance, and higher officials (MOH) have confirmed the data quality and utilization improvement. This has made our staff proud of their efforts."*

Additionally, they were involved in identifying gaps in data quality and information use in order to design a more effective implementation strategy. This collaboration was supported by one of the participants, the University of Gondar. [M&E officer with 5 years of experience] view:

> *"... initially we have identified gaps related to data quality and use with the University of Gondar, then the University of Gondar takes an assignment to design the intervention modalities, sometimes later UoG proposed health system leadership and governance intervention to capacitate HIS leaderships to improve data quality and information use.*"

Engagement

The involvement of leaders in the intervention process facilitated its implementation. However, the level of engagement varied across different facilities. While most leaders and key stakeholders were actively involved in improving data quality and information use, a few were not engaged throughout all the intervention phases. This lack of engagement was supported by one of the participants. [HMIS officer with 6 years of experiences] views as:

> "*Our hospital senior management team commitment was interesting towards implementing the intervention. They have supported the intervention by securing budget, monitoring, and evaluation, and establishing accountability for HIS performance.* "

Similarly, these leaders at the town health offices and facilities were more committed and engaged in the intervention process, bult less observed in the districts' health offices and facilities in the region.

> *"Leaders' engagement/commitment was different from facility to facility. There were more committed leaders at Assosa town health department and Assosa general hospital from the beginning to the end of the intervention. In contrast, at Assosa health centers, there was a leadership problem initially, but improvement after action was taken by Assosa town health*

department." [M&E officer, 5 years experience].

Executing

We found that most of the informants agreed that the intervention was conducted as per the plan. The finding showed that the intervention had not been conducted as planned because of task burdens and political and security problems. The informants were supported in their views as:

> *"In my opinion, the intervention was not implemented as per the plan because mentorship was planned to be conducted by the regional health bureau on a monthly basis, but it was not conducted as per the plan, and also, feedback was not given by regional health bureau …*" [HMIS officer, 6 years' experience].

Reflecting and evaluating

We observed robust reflection, monitoring, and evaluation of the intervention by all leaders involved. Most leaders agreed that the case-teams in their respective health facilities and/or offices conducted weekly self-mentorship and intra-case team performance monitoring. However, a few noted that the regional health bureau had not completed its tasks as scheduled or planned. Furthermore, ongoing political and security issues within the region have hindered the intervention from meeting its timeline. One of the facilities' HMIS officers [HMIS office with 6 years of experiences] expressed his view:

> "*We observed that there was monitoring of activities, especially leaders who were part of the intervention were concerned about the progress of the implementation. This may be due to the training they received.*"

Discussion

We examined the facilitators and barriers affecting the implementation of the TPF intervention on the production of quality health data and its use in Benishangul Gumz Regional State. Using the CFIR-Implementation framework, we explored the adapted and contextualized CFIR constructs to understand the facilitators and barriers of TPF for quality data production and use. Our study revealed that a significant number of participants reported that the intervention positively impacted the production and use of quality health data. The nature of intervention characteristics played a significant role in improving and using data quality. Additionally, the performance monitoring and feedback mechanisms positively influenced the implementation, as both the PMT and feedback-giving approaches grew stronger after the intervention.

The findings in this study indicated that the lower-level health system leaders were motivated to implement the intervention since the intervention encouraged health leaders who participated in the intervention. The participants believed developing an intervention package considering local health leaders could improve health data quality and use. The possible reason could be that the initial training provided to the implementers can boost their courage. It is a fact that good initial training can change the perception of implementers (15). The evidence generated in this study indicated that training health system leaders, mentoring, coaching, and provision of continuous onsite support could improve quality health data production and use. According to one study, developing leaders and healthcare provide a tool for bringing an effective and efficient health system to life (16).

The current study showed that health system leaders were interested in using the intervention to solve health system problems related to data quality production and utilization compared to the usual approach, as they believed that capacity building has numerous advantages in health data management and use. Leaders did not face difficulties adapting to the intervention since they had captured it and were equipped with the training components delivered by the supporting university (UoG). The possible reason might be that the skills and knowledge gained through TPF benefited them. Studies in this regard indicated that capacitating leaders through training had paramount importance in bringing improved health data quality and use (10) and improving the performance of health institutions for better health program achievement (12-14). The implementers suggested that it is adaptable and can be used to implement it on a larger scale.

Though promising effects were documented through the implementation of TPF and recommended by health system leaders to scale up in huge settings, geographical proximity, the ongoing war in the area, staff resistance, and the workload made the intervention a bit challenging. The main reason for the opposition to the implementation could be that implementers might have different competing demands and low perception of the value of health data. Studies indicated that personal attributes or other demanding activities and high workloads could influence the implementation (15,17).

Moreover, giving value to health data courage the implementers and enable them to keep producing quality health data, production, and use (18). Despite all the challenges, the research teams attempted to deliver the intervention by redesigning the different intervention strategies, such as creating a telegram platform for support and clarifying the issues related to intervention tasks.

In this study, outer settings were attributed both positively and negatively. The facility's identification of gaps related to quality data production and use enhanced the successful implementation of the intervention. The intention observed to implement the intervention due to the need for healthcare resources and their allocation towards achieving improved production and utilization of health data.

The effect observed was not only the bare effort of the intervention since the district has a multi-dimensional connection to escalate improved health data generation and use. For example, in the district, non-governmental

organizations are working on health promotion and disease prevention. Despite the minimal communication at the beginning, after the intervention, the engagement of health leaders to attain health sector vision via connecting through telegram and other communication platforms has affected the intervention to bring positive outcomes. Studies in this regard indicated that working with a leader's of paramount importance in bringing change in health system vision attainment (16).

Though various ambitions initiated among health system leaders were observed to improve health data production and use by implementing TPF intervention, the presence of competitive tasks such as campaigns, political commitments, and other accidental tasks was affecting the full attention of health leaders to implement the intervention. Political commitment (leaders' engagement) is one factor that enhance productivity (9). For better implementation, remedies such as understanding the competing projects and limiting exhaustive job aids improve the implementation (15,17).

It is a fact that improving health data has been a prioritized agenda of the Ethiopian government to achieve the intended outcomes in quality healthcare data production and use. The health system leaders at regional, zonal, and district levels were applying different strategies to ensure the information revolution agenda of the country.

The reason could be due to the attention given to health data quality and use as a top priority by the government of Ethiopia (19). However, motivational platforms and following a guiding rule concerning training and post-training follow-up to improve health data quality and use are uncommon at the local and national levels.

Our study explored how the absence of external policy and an incentivization scheme might have affected the implementation of the TPF intervention. Multiple studies suggested that incentivization led to improvement in the healthcare system (20, 21). Thus, the incentive policy and reward mechanism should be strengthened, as it can boost motivation and create a competitive environment among workers (22). Providing incentives for health staff is a recognized strategy to create motivation (23,24).

Our study showed that the inner component of CFIR has influenced TPF intervention in the Benishangul Gumuz region. The remoteness of the region might have an impact on TPF intervention. Though Ethiopia's health system structure is suitable for delivering health services to its population, the structure of specific service delivery units and health administrative units might matter for the quality of health system data production and use for decision making.

The current study revealed that the presence of a young age has influenced the implementation. This suggests that younger individuals are more capable of capturing the training package and implementing it effectively compared to older individuals (25). Additionally, peer-to-peer support or learning is a beneficial approach for enhancing data quality and use implementation. A study has shown that peer-to-peer learning is one of the preferred options for improving the production and utilization of quality data, as it facilitates knowledge sharing among healthcare staff (18).

In this study, we identified that capacitating health leaders, creating different platforms to portray information among health system leaders, and the availability of harmonized health system structure to facilitate the TPF intervention in the district. We found that the TPF intervention had shown a promising influence on networking, exchange of ideas, and information communication among health system leaders for attainment health data and use.

Prior to TPF intervention, health system leaders were hardly communicating for health system improvement, particularly in relation to the improvement of quality health data production and use. The evidence from this study indicated that TPF enabled health system leaders to create communication platforms and increased the level of communication in improving health data and use. A study showed that health data quality was increased through creating different meeting platforms (13).

Our findings indicated that the culture of data demand, quality data production, and data use was inclined in a positive direction after the TPF was implemented. For example, awareness among health system leaders has increased regarding health data generated and the value of collecting data at the facility level. The dependency of sending reports only for reporting purposes was changed, which was a common practice before TPF implementation. We verified that the change in attitude might bring positive experiences among the health system leaders toward quality health data production and use. The other reason could be that capacitating leaders through training and post-trainingfollow-up could increase the data demand and use (26).

Our study showed that in TPF intervention, there was some extent of resistance among health system leaders to absorptive changes, meaning that the shared responsibility and developing experience towards persistent improvement declined. Some health leaders, for example, have complained that additional training is required to achieve the desired results rather than continuing with coaching and mentoring. However, the challenge was solved by iterating the training for health system leaders and providing a refreshment to increase the acceptance of shared perceptivity.

In the current study, we found limited trained professionals like HITs. This could be due to the trained staff turnover and shifting of their career to other fields of study as there are no HIT retaining mechanisms such as incentivization and promotion strategies and needs attention to trained personnel in the area (27) and identifying and prioritizing the need enhances effectiveness in the program implementation (28).

Furthermore, this intervention positively changed individuals' knowledge and beliefs about the intervention's effect on data quality and use. The TPF intervention could improve knowledge of health data management and use it for decision making. The belief towards TPF also increased over time, as we identified that health system leaders were capacitated for quality data production and use after the TPF intervened. A study showed that leaders with poor knowledge and skill or limited capacity on health data production and use could bring wrong decision and wrong health system and end to worsen health programs (29,30). On the other hand, managers with limited -how on health data could bring devastating health system program outcomes. Therefore capacitating the leader is primary agenda in health system (31).

Furthermore, the stage of individuals towards the improved intervention outcomes showed a progressive change of leaders toward utilizing the TPF intervention. Our study revealed that the leaders were initially unaware of the detailed importance of health data and its use. Later, after the TPF intervention had been implemented, we observed changes among health leaders toward moving on to attain improved data quality and use. The soft skills and frequent coaching and mentoring had contributed for better data quality production and use.

In this study, regarding the implementation process component, the method of tasks for implementing TPF intervention was developed and planned among implementers in the district. According to our findings, the district had detailed planning to document the process and sustain the TPF intervention platform in the future. The reason might be that the capacitated health leaders could have the ability to plan detailed activities to achieve the desired outcomes, as the TPF might enable them to continue the intervention process.

In the current study, engagement of leaders in implementing and using the TPF intervention was promising. Health system leaders had tremendous commitment and sense of ownership to improve health data quality and use. Creating accountability is vital in health system. The practice observed after the TPF intervention might be the fact that the knowledge gained through training and post training follow - training follow-up could be helped them to adhereto the protocol of the intervention.

Moreover, accomplishing the TPF intervention according to the protocol indicated that though some leaders could executed the courses or activities delivered as per the protocol of the intervention, the majority of health system leaders were lagging in the stage of changes in improving the intervention outcomes, especially the schedule of the implementation was not rigid. The probable reason could be the political instability in the region.

Finally, the evaluation and monitoring component of CFIR indicated that though there were some intermittent monitoring and follow-up modalities, the district has its methods to evaluate its staff and other health system workers in producing quality health data and use.

Our study proved a huge improvement in capacitating health system leaders for improved monitoring and evaluation of health worker activities concerning quality health data generation and use of decision-making and healthcare planning. The role of health system leaders in evaluating and monitoring the tasks at lower level positively contributes to improving health system performance (32).

The study could be influenced due to some unobserved sources of bias. The response from participants and the transcriptions could have differences. However, the study was attempted to ensure its credibility by triangulating the responses of the participants' and the transcriptions. In the study, social desirability bias could occur, but the authors attempted to reduce it by avoiding yeah or head shaking during data collection. Though the participants were selected purposivelywe attempted to include participants from different positions considering their ability to respond to the questions. We tried to include essential reporting elements in qualitative study. Despite the limitations, the findings from this study provide useful information for exploring barriers and facilitators in training and post-training follow-up implementation and are possible to consider for further scale-up in similar and contextual environments.

Conclusion

The finding implies that implementers must focus on routine activities rather than being loaded by different accidental activities such as community-based tasks. PMT team meetings have crucial roles in progressing the data quality and use in connection with leaders' engagement. Enhancing the motivational components to leaders and health system workers could improve the data quality and use. Stakeholdersthe intervention's adaptability, and partners, and implementers engagement could influence the design of the intervention's adaptability. Close supervision and mentoring have a substantial role in escalating the intervention's outcome.

Moreover, using social media such as telegram has a crucial role in exchanging information concerning health system data quality and use. Training leaders and enhancing their engagement has a paramount importance. Furthermore, incentivizing and working on motivational components could boost the leaders' and health workers' engagement in producing quality health data and use. Awareness creation on the health system workers, promoting peer-to-peer support, valuing data for healthcare planning and use, and ongoing capacitating the leaders are vital to change health system data quality and use.

Acronyms/Abbreviations

CBMP: Capacity building and mentorship program
CFIR: Consolidated framework for implementation research
HIS: Health information system
HMIS: Health management information system

RH: Reproductive Health
LMG: Leader, manager, and governance
M and E: Monitoring and evaluation
TPF: Training and post-training follow-up
UoG: University of Gondar
WHO: World Health Organization

Ethical consideration

Ethical approval was obtained from the University of Gondar (RN.V/P/RCS/05/1038/2020) and the Benishangul Gumuz Regional State Health Bureau. Oral informed consent was obtained from all participants of the study. All data were collected based on codes, instead of mentioning the names of the respondents, to avoid indicating any personal characteristics. The COVID-19 protocol was maintained throughout the study.

Conflict of interest

Authors decaled no financial and non-financial conflict of interest

Availability of data and materials

Data will be available upon the request from the corresponding author

Consent for publication

Not applicable

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Authors' contribution

AA: Conceptualized the study, analyzed the data, wrote the manuscript, drafted the manuscript, edited the manuscript, approved the manuscript, and guided throughout the study;
TH: Conceptualized the study, analyzed the data, wrote the manuscript, drafted the manuscript, and edited the manuscript, approved the manuscript, and guided throughout the study;
LD: Conceptualized the study, analyzed the data, wrote the manuscript, drafted the manuscript, and edited the manuscript, approved the manuscript, and guided throughout the study;
AM: Wrote the introduction section and edited the manuscript; approved the manuscript and guided throughout the study;
DW: Analysed the data, edited the manuscript; approved the manuscript, and guided throughout the study;
MM: Edited manuscript; approved the manuscript, and guided throughout the study:
NA: Edited manuscript; approved the manuscript, and guided throughout the study;
BF: Conceptualized the study, analyzed the data, drafted the manuscript, edited the manuscript, approved the manuscript, and guided throughout the study;
BT: Conceptualized the study, analyzed the data, drafted the manuscript, edited the manuscript, approved the manuscript, and guided throughout the study.

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