Assessment of barriers to the implementation of community-based data verification and immunization data discrepancies between health facilities and the community in Tach Gayint district, Northwest Ethiopia.

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Abstract

Introduction: While community-based data verification (CBDV) is critical for effective implementation of immunization programs, limited evidence exists detailing its implementation at the local levels thereby threatening data quality which is used to guide decision making.

Aim: To explore the barriers to proper implementation of CBDV and determine the level of immunization data discrepancy between the health facilities and community levels in Tach Gayint district of Northwest Ethiopia.

Methods: A Mixed methods approach was used. Interviews with twenty-six key informants' (health experts) in immunization data, and an additional a sample of 324 infants were recruited. All health centers in the district (6) and 2 health posts from each health center (12 in total) were selected using Simple Random Sampling. Key informant interviewees were purposely included from all health facilities. For quantitative data, samples of infants were proportionally allocated for each health facility as per their DPT/Pentavalent-1 vaccine report. Thematic analysis of the qualitative data and descriptive quantitative analysis were performed using statistical software open-code v-4.02 and STATA v14.1 respectively.

Results: Only few health facilities implemented CBDV and consider it to be their routine task. Also, barriers to effective implementation of CBDV such as lack of prioritization, poor capacity among health staff, and conflicting job roles were identified. The highest immunization data discrepancy among community and health facilities was observed for the measles-one vaccine (35.4%), and the minimum was for DPT/Pentavalent-1 (25.6%).

Conclusion: This study revealed a poor level of CBDV implementation and barriers to its effective implementation which include lack of prioritizing CBDV, limited capacity among health staff in performing CBDV, and conflicting job roles among health staff. There was a high level of immunization data discrepancy for measles-1 and DTP/Pentalent-3 vaccines. Based on our finding, we make the following recommendations: building skills among health workers to perform CBDV, enhancing availability and use of standard CBDV tools, ensuring monitoring, and control mechanism, and setting clear definition of roles regarding CBDV, as well as closing the gap in level of immunization data discrepancy could help foster effective implementation of CBDV. [*Ethiop. J. Health Dev.* 2021; 35(SI-3):09-15]

Key words: Immunization, CBDV, Data discrepancy, Data quality

Introduction

Immunization is one of the most significant interventions for controlling vaccine-preventable diseases (VPD) and deaths among the child population (1). Even though vaccination currently prevents more than 2.3 million deaths each year, an estimated 19.7 million children under the age of one remain unvaccinated (2). In Ethiopia, the immunization program has been implemented since 1980 as part of Primary Health Care (3). Recent studies indicated vaccine uptake of children to be low in Ethiopia (4).

Quality of immunization data is crucial for effective monitoring and evaluation of immunization programs (5). In Ethiopia, however, immunization data from the point of entry (health facility) through to the reporting system is still poor (6). Studies have shown a significant level of discrepancy between data generated through the Health Management and Information System (HMIS) and data from population surveys such as the EDHS (7). In 2019, full immunization coverage was 43% according to the EDHS, (8) and 88% according to the HMIS (9). A comparison between the EDHS and the HMIS also showed significant discrepancies in DPT/Pentavalent-3 coverage rates (36%) and measles-1 coverage rates (32%) (8, 9). Furthermore, comparison of HIMS data with WHO-UNICEF estimates showed a discrepancy of about 28% for DPT/Pentavalent-3 coverage, and 33% for measles-1 coverage in 2019 (10). In the Amhara National Regional State, when the 2019 mini-EDHS report was compared with the regional report for the same year, it showed a discrepancy of 22% for DPT/Pentavalent-3. On the other hand, a data quality review (DQR) conducted in 2018 by the Ethiopian Public Health Institution (EPHI) revealed that HMIS indicators were under-reporting coverage. According to the DQR, the Amhara region had the largest proportion of health facilities (26%) under-reporting DPT/Pentavalent-3(11).

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Several data quality assessments and review methodologies and tools are available to evaluate the quality of HIMS data, including the Performance of Routine Information System Management (PRISM) framework, Lots Of Quality Assurance Sampling (LQAS), and Routine Data Quality Audit (RDQA) (12). The RDQA has been primarily used to determine the discrepancy level by comparing data collected from health facility primary data sources (medical records such as registers) against reports of selected indicators (13). In addition to these tools, in 2018 the Ethiopia FMOH developed health data quality review guidelines which included a Community Level Data Verification Mechanisms (CBDV). This should be conducted whenever a RDQA is carried out at the facility level, by comparing selected priority indicators from health facility data sources with community-level data sources (14).

To a greater degree, CBDV can play an important role in increasing effectiveness of the immunization program. It could serve as a data verification technique to track and monitor program performance and guide the development of implementation strategies and policies (15). It can also foster the identification of available home-based infant immunization records to facilitate coordination and continuity of immunization service. Furthermore, it can facilitate communication between health care providers, both between and within the health facilities, and with mothers or caregivers of children in the community (16). It is also essential for improvements in caregivers' awareness, compliance, and empowerment in terms of health seeking behaviors, and to track unimmunized, missing, and default children within the community (15, 17, 18).

While immunization data quality assessments are being routinely conducted at the institutional level, evidence on implementation of community-level data verification is not available, in Ethiopia. This implementation research therefore explored the barriers and facilitators to implementing a community-level data verification mechanism and determined the level of immunization data discrepancy between routine data collected in the health facilities and at the community level in Tach Gayint district of Amhara Regional State, Northwest Ethiopia.

Methodology
Study design
This study was carried out in Tach Gayint district. Thach Gayint is one of the districts of Amhara National State, located in south Gondar zone, Northwest Ethiopia, 766km away from Addis Ababa and 200 km away from Bahirdar, the capital city of Amhara Regional state (19). A mixed methods approach (qualitative and quantitative) was used in this study. The CBDV implementation status, and its barriers were explored using the qualitative (phenomenological) study design. A facility and community-based cross-sectional survey was carried out to determine the level of immunization data discrepancy between the health facility and the community.

Study population
For the qualitative component of this study, interviews were conducted with health workers responsible for entering, analyzing, or reporting immunization data. Thirty-one key informants were identified, and only 26 were interviewed as saturation was reached. Among the 26 key informants, 6 of them were health center heads, 4 HIT technicians, 6 EPI focal persons, 9 HEWs, and one was the head of the district health office. For the quantitative part, a total of 324 immunized infants were included in the facility and household survey. However, 39 (12%) were excluded from the analysis as they could not be traced.

Sampling procedure
Due to the nature of the study, implementation research, the study site was preselected by the Amhara Regional Health Bureau. The reason being that, among the districts in the Regional State, Tach Gayint has an evident gap in the immunization services data quality, this was perceived to be beneficial in helping identify and learn the barriers to CBDV In total, 18 government-owned health facilities in the district were selected for this study. All health centers in the district (6) and 2 health posts from each health center (12 in total) were enrolled using Simple Random Sampling. Five of health centers were in the rural area, and one in an urban setting.

For qualitative part, one health extension worker (HEW) per health post, one EPI focal person per health center, one Health Information Technology Technician (HIT) per health center, the head of each health center, and the head of the district health office was purposely invited to participate.   The sample size for the quantitative component of this study - a household survey - was determined based on the Ethiopian FMOH recommended sample size for community-level data verification (14). According to Ethiopian District Health Information System (DHIS-2) report, eleven months before this study (July-2019 to May-2020), there were 2587 under one year of age children immunized for DPT/Pentavalent-1 in Tach Gayint district. We selected 13% of these children that made a sample of 324. The mentioned guideline recommends the use of a minimum sample of 5% of service user's entries from primary data sources (i.e. immunization registration book, and family folder) at health facilities. Therefore, to achieve a considerable sample, 13% of the sample population was the minimum sample size required by the guideline. Samples of infants were proportionally allocated for each facility per their DPT/Pentavalent-1 report. A list of children from the primary data sources was used as a sampling frame and infants' records were selected from the list of records using a systematic random sampling technique.

Data collection
Both qualitative and quantitative data were collected from 1 to 9 of June 2020. The qualitative data was obtained to identify the implementation status of CBDV, the available techniques to conduct CBDV, as well as to identify the barriers of CBDV implementation by exploring the lived experiences of

the study participants. The data was obtained using an interview guideline prepared in English and translated to the local (Amharic) language (Supplementary material_1). The Key Informant Interview (KII) was conducted by two research team members from the Amhara Regional Health Bureau and the University of Gondar. One of the research team members was from the Amhara Regional Health Bureau and the health bureau's immunization service coordinator, also a member from the University of Gondar and an expert in the health information system.

Quantitative data were obtained to determine the level of immunization data discrepancy between health facilities and the community. An interviewer-administered questionnaire prepared in English was used to collect data from the households and facilities (Supplementary material_2). Four trained data collectors carried out the data collection. data commenced at the health facilities. Of all the children recorded on the immunization primary source documents, those who at least received the first dose of DPT/pentavalent-1 were selected. children's immunization history was recorded on the prepared data verification format along with other demographic information such as the child's name, date of birth, address, and mothers' name at the sampled health facilities. Demographic information was taken to help identify the identities and addresses of the children during the household survey. Data collectors conducted a visit to households in the community where the selected children resided. The caregiver/mother was interviewed about the basic information of the child to confirm whether the child is exactly among those listed from health facilities. The interviewer requested the child's vaccination card and filled in information about vaccination status from the infant immunization card in the verification tool.

Both interviewer-administered questionnaires and interview guidelines were prepared by the research team. Shortly before the data collection fieldwork, a three-day workshop was held in Bahir Dar for reviewing and finalizing the data collection tools. Data collection tools were also piloted. The training for the four quantitative data collectors, accompanied by one-day field practices was conducted two days after the workshop at Zenzelema health Center, around Bahirdar.

Data analysis
A concurrent qualitative- quantitative analysis approach was used. For the qualitative part, recorded data was transcribed verbatim, and analyzed using open-code software v-4.02. Thematic analysis was performed – data was synthesized, codes were generated and categorized into sub-themes, and further categorized to form main themes. Descriptive quantitative analysis was done to determine the level of immunization data discrepancy between the community and health facility. Data obtained from the facility data sources and household survey were analyzed using STATA version 14. An outcome variable was the level of immunization data discrepancy. We included 5 vaccine types in the

analysis namely: Measles-1, DPT-Pentavalent-1, DPT-Pentavalent-3, Rota-2, and BCG vaccine. Accordingly, data was cleaned, coded, generated, and categorized. The frequencies of records from primary data sources at health facilities were determined for all included vaccines and compared with the immunization data recorded on the infant immunization card at the community. Further, the level of discrepancy was calculated for each vaccine type, as a percentage, and presented in a graph. Both qualitative and quantitative data analyses were done by the research team.

Results
The CBDV practice and its barriers
The qualitative findings are summarized into two main themes: the CBDV implementation practice, and barriers of CBDV. The CBDV implementation practice ranged from health facilities conducting regular verification, to facilities with no practice of CBDV. Approaches to CBDV were also varying among health facilities. It includes, verifying by looking for a BCG scar of vaccinated children, crosschecking facility data with infant immunization cards, reviewing immunization history from mothers, and using a checklist for integrated supportive supervision of the HEWs package. Lack of prioritization, poor capacity building development and conflicting job roles were main barriers identified that impede the implementation of the CBDV.

The CBDV implementation practice
This study found that only a few health facilities regularly conduct CBDV. According to many KII study participants, among health centers that conducted CBDV, checking of baby's BCG scar, and taking vaccination report from the mother were common techniques used for verifying children's immunization data at the households.

For instance, Health Officer, head of the health center, said that.
> *"Yes, we are implementing it (CBDV). HEWs have a list of vaccinated children at the health post. We take the information (immunization information) and go to the community. So, we look at the baby's scars to make sure if the baby is vaccinated for BCG or not."*

As mentioned by many KII study participants, this study revealed that some health facilities had no verification methods to check whether the child was vaccinated for vaccines other than BCG that have not left a physical sign on the child except taking the information from the caretakers or mothers.
> *"Taking immunization history from the mother is the only technique for verification of a baby's vaccination status. We ask the mother if the baby is vaccinated in the ninth month.... Mothers and the community are aware of immunization. For example, to confirm the measles vaccine, we asked the mother if the baby was vaccinated on his/her upper left arm." – Health Officer, head of PHCU*

The KII study participants also reported that the CBDV was never conducted as an independent exercise, but rather performed whenever health professionals had the opportunity to be in the community for other tasks. In fact, in almost all the health facilities that conducted CBDV, the exercise was often integrated with other activities, such as supportive supervision of health extension package, and Vitamin-A and deworming campaigns.

A midwifery nurse, health centers' head, said.
> *"We have a list of children who need to be vaccinated. So, we follow those children…. Therefore, even though it doesn't make sense to say, we verified all vaccinated children, but, occasionally when we go to the community for another job; we ask mothers if babies are vaccinated, and they tell us. So, we know a lot about the baby's immunization status."*

A clinical nurse, health centers' head, added.
> *"We have never worked independently. We conduct by integrating with other outreach activities such as deworming."*

Further, from the KII data we identified that one of the health centers regularly conduct CBDV by taking a sample of immunized children from the health facility and crosschecking with immunization cards of the infants at their households.
A Clinical nurse working as EPI focal in the health center, stated.
> *"We are verifying children's vaccination status using immunization cards at the household – often we take a sample of 5 children. This process started a long time ago during the era of the previous head of this Health Center. Activities are still ongoing, and we have a schedule. Also, we have checked children's vaccination status by observing cards available with mothers in their households."*

Despite the many progresses highlighted, several study participants still indicated that CBDV was not being carried out in many health facilities, as stated by a study participant.
> *"We have not done the survey or CBDV to ensure whether the actual numbers of vaccinated children living in the communities were consistent with reported data through EPI monthly reports at the health posts level. We had no plan for CBDV. And, I haven't organized any CBDV activity till today."*

Barriers of CBDV
Three subthemes emerged from the KII, pointing to the following main barriers to implementation of CBDV: lack of prioritization, poor capacity building development, and conflicting job roles of health professionals.

Lack of prioritization
This study revealed lack of prioritization as one of the leading barriers to implementation of CBDV.

According to interviewees, CBDV has not been prioritized by many health facilities, compared with efforts to increase vaccine coverage and tracing immunization defaulters.
> *"To be honest, we have never conducted CBDV because most often, our checklist is focused on tracing immunization defaulters. Our concentration is on improving immunization coverage, so we haven't work on what you are asking about (CBDV), and neither have we verified It (CBDV)."*– EPI focal point of contact

On the contrary, the qualitative findings of this study indicated that CBDV can be easily implemented if enough attention is paid, as stated by one of the researches participants;
> *"We were not doing the community data verification as a priority task to improve data discrepancy between the register and the family health card…. according to my understanding, low attention is the only reason for poor implementation of CBDV. It (the CBDV) does not need much more resources and skill, only needs strong commitment."*

Poor capacity building
This study revealed a lack of capacity building that can consistently engage health workers through active training and follow-ups of progress on implementation of CBDV. Many KII respondents at the health center mentioned that they hadn't received any training on CBDV and didn't know how to conduct it. According to these study participants, continuous support, and guidance especially from the district office are necessary to enhance effective implementation of CBDV.
> *"I had no training in CBDV. The health facility heads, as well as a district office, were not providing us guidance to conduct CBDV on regularly intervals. We lacked the technical skill on CBDV. I am ready and have no problem doing the CBDV if the challenges I mentioned are improved. The district office, along with facility leaders, can provide such support."* – HIT personnel

Conflicting job roles
This study also found poor commitment on the part of health professionals to embark on community-level immunization data verification activities, due to a lack of clearly defined roles. Health professionals often feel CBDV is not part of their responsibilities. This has resulted in ineffective working environments since health professionals can choose which roles to adopt.
A HEW with 14-year experience stated that.
> *"We provide immunizations with other HEWs. We do non-vaccination work separately…. Regarding verification, it's up to the concerned one who wants to verify our work. This (conducting CBDV) is not a task that is expected of us."*

Immunization data discrepancy between health facility and household

At the district level, according to the quantitative data of our study, all children included in the analysis (285) were vaccinated for the DPT/Pentavalent-1 vaccine, while only 82(28.7%) were vaccinated for the measles-1 vaccine. The level of immunization data discrepancy was determined by verifying the data from the health facilities' primary data sources against the data collected from the infants' immunization card. A level of data discrepancy was determined for five vaccine types namely, BCG, DPT/Pentavalent-1, Rota2, DPT/Pentavalent-3, and Measles first dose. The level of immunization data discrepancy varied by antigen: the highest discrepancy was observed for the measles-1 (35.4%), and the minimum observed discrepancy was for pentavalent-1 (25.6%). (**Figure1**)
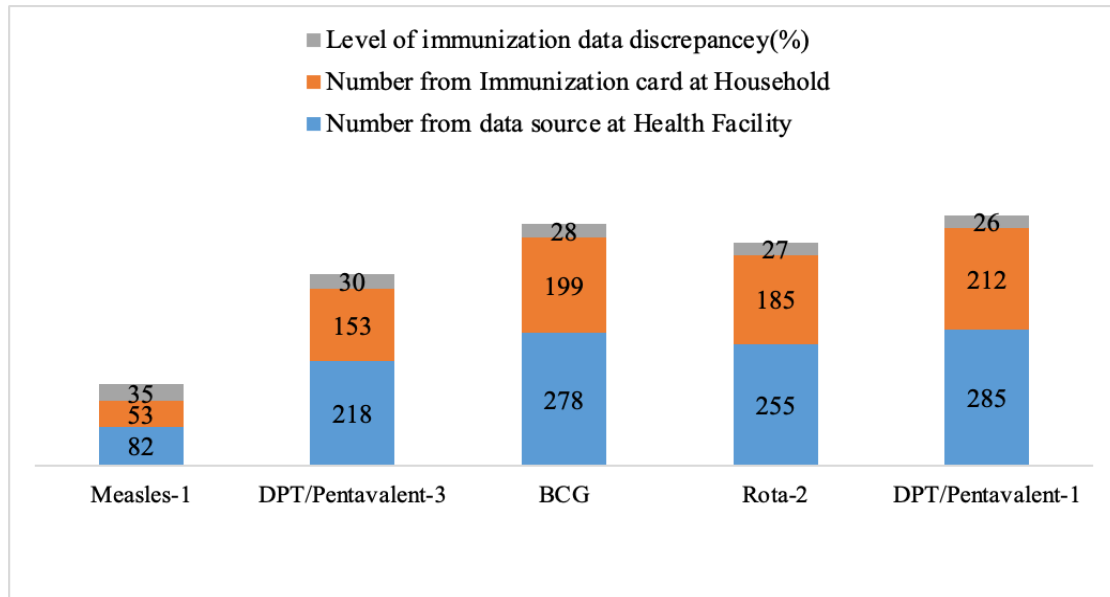

Figure 1: a level of immunization data discrepancy between the health facility and community level, in Tach Gayint district, Northwest Ethiopia, 2020

Discussions

Only a few health facilities consider the CBDV to be part of their routine task. Lack of attention at all levels, training and skill gaps, lack of priority setting for CBDV, and conflicting job roles were some of the identified barriers hindering the effective implementation of CBDV. The level of immunization data discrepancy between the health facility and the households was high and varied by types of vaccines.

Based on our findings, many health facilities did not perform CBDV as a routine activity, to help improve immunization data quality. This contradicts the national HMIS data quality guideline, which outlines CBDV as one of the data quality control mechanisms (14). Although CBDV is designed to be implemented along with facility leve1 RDQA, the current system does not promote regular planning, implementation, and monitoring of CBDV. There is no standard tool purposively designed to enhance CBDV implementation across all levels. This is consistent with the qualitative findings from our study. Moreover, while the routine HMIS encourages the practice of data quality audits such as LQAS at the facility level, it places less emphasis on capacity building, such as targeting implementation of CBDV. Despite the data discrepancy among the community and health facilities level, these discrepancies could also be a source of data quality gaps for the health information system as whole. There is evidence that both governmental institutions and donors in technical support of the HMIS, often neglected CBDV, while focusing on health facility level data quality assurance techniques such as LQAS and RDQA (12, 13).

This study indicated that the discrepancy of immunization data between the health facility and home-based immunization data sources was substantial. Among the vaccine types, a high data discrepancy was observed in measles-1 and DPT/Pentavalent-3 vaccines. The findings of DPT/Pentavalent-3(30%) was slightly lower when compared with the discrepancy between the EDHS and the routine HMIS report of 2019, which indicated data discrepancy for DPT/Pentavalent-3 to be at 36% (8, 9). This might be due to the difference in the approaches of data collection techniques; including the fact that EDHS data is obtained using verbal reports from mothers/caretakers in addition to data from immunization cards of infant in the households. Our findings for measles-1(35%) are comparable with the discrepancy between the same year of EDHS and the routine HMIS reports that indicated a 32% discrepancy of the measles-1 vaccine. This is probably because, although the EDHS relied on the verbal information from the mothers in addition to data from immunization cards of infant, there is a higher chance that mothers easily recall measles-l since it is the most recent vaccine that has been provided for the children.

Per our quantitative findings, the level of data discrepancy varies across health centers: which was the highest for all vaccine types in the only urban health center of this study. We believe this might be related to the awareness gaps among HEWs regarding Urban

Health Extension Programs (UHEP's) immunization data recording and reporting procedures. Although the UHEP allows immunization information to be recorded at the health posts, and with its own immunization data recording and reporting procedure (20); from our qualitative data, we learned that some urban HEWs do not have records on immunization. The main reason for this may be related to the lack of experience in the UHEP in terms of its utilization among the urban community also in its information system implementation, as compared to the previous and relatively productive rural HEP being implemented in Ethiopia since 2004. With this, a study conducted in Gondar city on the use of the UHEP reported, that the lack of knowledge on the UHEP among the urban communities and distorted perception among the public, towards the competency of urban HEWs as factors associated with poor utilization of UHEP. Consequently, this may lead to a lack of motivation among urban HEWs for the program implementation, also in engaging in UHEP related data management practices (21).

The high data discrepancy is an indication that, data verification system at the community level is not implemented regularly per the required standards. Failing to conduct the CBDV suggested that healthcare workers, officials, and managers only monitoring facility-level data which is very limited in observing the quality of immunization data. It also affirms that the quality of EPI program information needs to be enhanced to help reduce vaccine-preventable morbidity and mortality (5, 6) – as supported by the findings from the Key Informant Interviews which highlight the pressing need to improve data accuracy on immunization at its source (i.e. at health post and health centers levels). If it had been implemented, however, the CBDV would have accelerated the improvement of immunization data quality by controlling manipulated reports, which helped to produce reliable data that informs decisions at local and above levels for immunization service improvement (16). Besides, the CBDV can play a significant role in the quality-of-care improvement, by supporting health facilities to see gaps (related to the services provided to the community), build relationships and trust (among health facilities and the community), and enhance the community engagement in immunization program improvement (15, 18).

This study applied both qualitative and quantitative methods to explore the barriers of the CBDV and determine the level of immunization data discrepancy. It included the study participants from the lower level of the health system to the district office level that encompasses a wider scope to accommodate different perspectives. The findings highlighted the CBDV implementation challenges at the lower level of the health system and uncovered immunization data gaps between the health facilities and the community. The findings, in terms of the level of immunization data discrepancy, is essential for health facilities to revitalize the CBDV implementation modality in line with the existing health facility levels RDQA techniques. As most health facilities were not implementing the CBDV; this study could not identify facilitators per the plan. Fortunately, from the qualitative data of this study, we noticed that, if attention is paid at each level; CBDV is a program that can be easily implemented as mentioned by some KII study participants of this study.

As there is a lack of evidence on the implementation level of CBDV in Ethiopia, the findings of this study are significant, as it identified its implementation status and barriers, and revealed the level of immunization data discrepancy between community and health facilities. Any stakeholders within the HIS, using the findings from this study, can design different strategies to close the immunization data discrepancy between community and health facilities, as well as to improve implementation of CBDV. However, it should be realized that this study was limited to a single district and would be difficult to conclude findings for the contexts other than a study site. Also, the limitation of this study is that its qualitative findings solely represent the study participants' views, not tested by advanced statistical methods. So that, future studies should expand the scope of this study and focus on examining the hypotheses suggested by these study participants.

Conclusion
This study revealed a poor level of CBDV implementation and barriers to its effective implementation. Some of the barriers include lack of prioritization, poor capacity building development, and conflicting job roles among health professionals. The level of data discrepancy was high among health facilities in the district. Of the vaccine types, a high data discrepancy was observed in measles and DPT/Pentavalent-3 vaccines. Based on the findings of this study, we suggest that: capacity building of health workers in conducting CBDV, designing of standard tools and approaches for CBDV, design and implementation of consistent monitoring and control mechanism, and clear definition of roles and responsibilities regarding CBDV among health staff could help foster efforts the aim to promote effective implementation of CBDV.

Declaration
Ethical approval and consent to participate
The research team obtained ethical clearance from the Institutional Ethical Review Board of the University of Gondar. Interviewees provided written consent before data collection started. They also had the right to participate, refuse to be interviewed or to withdraw from the interviews at any point in time. Personal data of interviewees were also coded in such a way that all personal identifiers were removed. The research teams were again honest and objective in reporting the findings of this study.

Availability of data and materials
Data will be available upon reasonable request from the corresponding author.

Competing interests
The authors declared that that they have no competing interests.

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