

Original Article

Accelerated Mentors Training for Health Information System Transformation Using a Practice-Based Learning Approach: The Hawassa University CBMP Experience, Ethiopia

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Abstract

Background: The implementation of the Health Information Systems (HIS) transformation agenda of Ethiopia's Ministry of Health plays a critical role in improving healthcare delivery. However, achieving this requires skilled mentors to guide healthcare professionals at each healthcare administrative level and health facilities. The Capacity Building and Mentorship Program (CBMP) is a collaborative program between Ethiopia's Ministry of Health (MOH) and six public universities, including Hawassa University, aimed at transforming the health information system. A significant challenge in sustaining these changes, especially at the woreda and facility levels where the program is expected to be implemented, is the shortage of trained HIS mentors. To address this critical gap, CBMP implemented an accelerated HIS mentorship training using a predominantly context-based, Practice-Based Learning Approach (PBLA).

Methods: Practice-based short-term accelerated mentorship training for 25 newly recruited mentors and HIS workers was conducted from May 5-10, 2024 followed by one month of practical learning and follow-up activities at the participants' respective facilities. Participants were purposively selected from Hawassa University CBMP, CBMP implementation woredas/ districts in the Central Ethiopia Region and Sidama National Regional State, as well as from Hawassa University CBMP Consortium Universities (Dilla and Arbaminch Universities), utilizing a PBLA. During the training sessions, a brief introduction to mentorship and its implementation in HMIS was provided. An overview of the IR Implementation Guideline in mentoring, how to use standard HIS assessment tools during mentoring the mentees, and the practical attachment of the training with actual health facilities for mentorship practical training were also covered. During this time, trainee mentors were assessed based on tangible improvements in Health Information System (HIS) changes, demonstrated through real-time guidance of mentees and measurable results at targeted facilities. Data was recorded using Kobo Toolbox and analyzed using SPSS version 27 and STATA version 17. The outcome of the training, observed as a real change for improvement in HIS, was assessed using before- and after-intervention assessments with a

paired t-test to measure the training's practical effectiveness.

Results: As an immediate outcome of the practical training, the trainees' mentorship for change demonstrated remarkable improvements in practical HIS areas. The intervention significantly enhanced HIS scores at all health facilities. For instance, in second-stage facilities (Health Centers, Health Posts, and the primary hospital), the HIS score improved from 50.2% to 75.3%, 43.5% to 63%, and 51% to 74% respectively. These improvements were statistically significant using a Paired t-test ($p < 0.05$).

Conclusion: The accelerated mentorship training using the PBLA approach in the actual work area looks effective and efficient by reducing the number of training days, focusing on skills transfer through practice rather than theory, and meeting dual purposes; the training and change in HIS at the same time. Thus, the accelerated mentorship training using the PBLA approach is a promising method to meet the current critical need for IR mentors.

Keywords: Accelerated, mentorship, training, Practice-Based Learning Approach, CBMP, Health Information Systems.

Introduction

The advent of Health Information Systems (HIS) marks a significant advancement in the management and delivery of healthcare services. HIS enhances the efficiency of healthcare providers, improves patient outcomes, and ensures the accuracy and accessibility of health data. However, the successful implementation of HIS relies heavily on the presence of skilled mentors who can guide healthcare professionals through the complexities of these systems. Recognizing this need, Hawassa University's Capacity Building and Mentorship Program (CBMP) in Ethiopia has pioneered an innovative approach to accelerate HIS mentorship training through a Practice-Based Learning Approach (PBLA) (1, 2).

PBLA is an educational strategy centered on hands-on, context-based, experiential learning, and real-working environment skill application. This method is particularly effective for HIS training, where theoretical knowledge must be seamlessly integrated with practical application. By immersing mentors in real-world scenarios and providing immediate, actionable feedback, PBLA ensures that they acquire the necessary competencies swiftly and effectively. This accelerated training model not only shortens the

learning time but also prepares effective mentors to immediately contribute to their healthcare facilities upon program completion (1-3).

Hawassa University's CBMP recognized the urgent necessity of proficient HIS mentors. The PBLA approach aims to train mentors with a good understanding of HIS, enhance problem-solving abilities in real-time, and foster continuous improvement within healthcare facilities. Experiences from Hawassa University's CBMP have demonstrated PBLA's effectiveness in training, showing that with the right strategies, mentors' skills and preparedness can significantly improve in a short time. Furthermore, with the support of mentors, the PBLA fosters a collaborative learning environment where trainees share their best practices, discuss challenges, and collectively develop solutions (3).

Many healthcare professionals, especially in low-resource settings, often face challenges in maintaining data quality and using information effectively due to ineffective and insufficient training or exposure to ways of data management practices. This gap in knowledge and skills can lead to inefficiencies, inaccurate data reporting, and poor decision-making. By providing skilled

mentorship training, experienced mentors can bridge these gaps, ensuring that less experienced workers acquire the necessary competencies. The PBLA approach, which combines theory with hands-on experience, further enhances learning, enabling mentors to apply their skills in actual environment contexts. This targeted training is crucial for improving the effectiveness of health information systems, ultimately contributing to a better healthcare delivery system. This paper presents the experience of Hawassa University's CBMP in implementing an accelerated HIS mentorship training using PBLA, to evaluate its effectiveness in capacitating mentors and improving HIS performance at health facilities.

Methods and materials

Study Area and Period

This study was conducted by Hawassa University CBMP, a collaborative program between the Ministry of Health and six public universities in Ethiopia, in which Hawassa University is the one. The training and subsequent practical applications took place in Sidama National Regional State; Shebedino, Tula, and Aleta Chuko woreda health care facilities. The intensive mentorship training was conducted from May 5–10, 2024, followed by one month of practical learning and follow-up activities at the participants' respective facilities.

Study Design

A before-and-after intervention study design was utilized for this accelerated mentorship training approach. This design enabled the assessment of participants' effectiveness by measuring HIS performance before and after the PBLA intervention.

Participants and Sampling

The study participants were newly recruited mentors and HIS workers from Hawassa University CBMP consortium universities

(including Arbaminch University and Dilla University) and HIS workers from CBMP implementation sites in the three regions (Sidama, Central Ethiopia, and South Ethiopia). A total of 25 participants were purposively selected from these aforementioned areas, specifically from CBMP woredas/districts such as Sankura and Cheha in the Central Ethiopia Region, and Shebedino and Aleta Chuko in the Sidama National Regional State. Participants were included if they were newly recruited mentors or actively involved HIS workers in the target regions and facilities collaborating with CBMP.

Intervention: Accelerated Mentorship Training using PBLA

The intervention comprised a five-day intensive HIS mentorship training conducted from May 5–10, 2024. Following this intensive training, the trainees continued implementing their mentorship practical learning at their facilities for one month as part of their routine HIS activities, with follow-ups conducted by senior CBMP mentors. The training sessions were conducted and supervised by experienced senior CBMP mentors, ensuring adherence to standard guidelines. The training utilized the Ministry of Health's (MOH's) standard Health Information System (HIS) assessment tool and the Information Revolution (IR) Implementation Guideline in Ethiopia.

The training program was systematically divided into two main stages, further broken down into four distinct phases, as illustrated in **Fig. 1**.

Description of the Stages:

Stage One: Basic Theory & observation of model facilities, Visual Chart (In-class)

The first day consisted of brief theoretical sessions covering: Principles of mentorship and their application to HIS, an overview of the Information Revolution (IR) and its

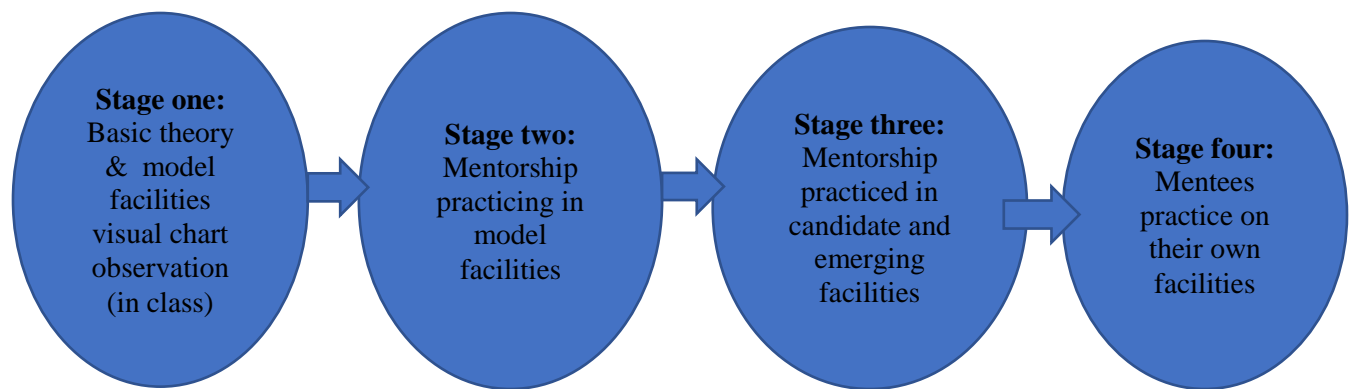


Fig 1. Accelerated mentorship training path, Hwassa University -CBMP, 2024

implementation Guidelines in Ethiopia, discussion of the IR implementation progress in CBMP woredas, introduction to both model and candidate woredas and health facilities, review of the revised HIS assessment tools for health centers, health posts, hospitals, and woreda health offices, observation of visual charts depicting actual representations of model health facilities, section by section, highlighting HIS structure, data quality, and information use with detailed indicators.

The objective of this initial theoretical session was to lay a foundational understanding of mentorship, its conduct, and basic communication. It also aimed to provide contextual understanding, enhance participants' knowledge of assessment tools, and use exemplary visual charts from actual model facilities to make the training more tangible and motivating.

Practical Training Sessions (Stages Two, Three, & Four)

Stage Two: Mentorship Practicing in Model Facilities

On the second day, trainees were deployed to selected model facilities in Shebedino Woreda and Tula subcity, specifically Morocho HC,

Gebre Kirstos HC, Morocho Shondolo HP, and Tula Primary Hospital. This stage focuses on hands-on practical learning of mentoring in assessing the HIS implementation statuses of primary healthcare units, hospitals, and woreda health offices. Under the direct supervision of senior mentors, trainees evaluated HIS implementation, rated current status, and identified gaps using the standard MOH's HIS assessment tool. HIS implementation status was assessed based on three criteria identified by MOH: HIS structure (30%), data quality (30%), and data usage (40%). Checklists for each theme were used to evaluate facility status, identify tailored interventions, and measure before-and-after practical learning interventions. During this period, trainers guided trainees on how to practically mentor mentees in identifying gaps, applying tailored interventions, and leveraging the current status of the facilities. As these were model facilities, this stage was typically completed within a single day.

Stage Three: Mentorship Practiced in Candidate and Emerging Facilities

On days three, four, and five of the training sessions, trainees assessed the HIS implementation status of emerging and candidate primary healthcare units to gain more insight into mentoring mentees on transforming an

emerging and candidate facility into a model one. For this phase, the Aleta-Chuko district in the Debub Sidama Zone of Sidama National Regional State was selected. All health centers (Gambela, Hallo, Loko Hayitala, Dongora, Miridicha, Rufo Chanco, and Futahe Health Centers), four health posts (Teso, Gunde, Korke, and Chinco Woyama), and Aleta Chuko Primary Hospital were included in this practical assessment intervention. The practice-based mentor training activities during this time included determining the HIS status as a pre-intervention baseline, identifying gaps, implementing targeted/tailored interventions, measuring the change after the intervention, and comparing baseline and post-intervention scores of HIS implementation. Throughout these days, trainers practically transferred skills of mentoring for change by considering HIS structure, data quality, and information use. The pre-post intervention difference observed here was expected to indicate both the change in mentorship trainees' skill and the improvement in the facilities' IR status.

Stage Four: Mentees Practice on Their Own Facilities

In the final stage, mentees implemented their mentorship techniques in their own facilities without direct supervisor follow-up, relying on remote guidance and final assessment. The facilities included in this stage were all health centers in Aleta Wondo, Wonago, Cheha, and Sankura, and all health posts in Cheha and Aleta Wondo woredas. Additionally, four hospitals (Aleta Wondo PH, Atat PH, Woteraresa PH, and Alemgebeya PH) were also included in the practical assessment by trained mentees. This stage aimed to evaluate the mentees' capacity to sustain their learning and successfully apply it in real-world, independent settings.

Dependent and Independent Variables

The independent variable in this study was the PBLA-based accelerated mentorship training.

The dependent variables were the Health Information System (HIS) performance scores, specifically measured across three output criteria for the mentees' training effectiveness: HIS structure, data quality, and data use, and aggregated into an overall Information Revolution (IR) score. These scores were assessed both pre- and post-intervention.

Data Collection Procedures

Data were collected using pre- and post-intervention HIS assessments at various stages of the training. Standardized Ministry of Health (MOH) HIS assessment tools, consistent with the IR Implementation Guideline, were utilized. These tools were administered through Kobo Toolbox for efficient and accurate data capture. Data was collected by the trained mentors and researchers involved in the program. To ensure consistent administration, all data collectors received a thorough orientation on the assessment tools and Kobo Toolbox usage, and their activities were supervised by senior CBMP mentors. The pre-intervention measurements were taken before any practical application, while post-intervention measurements were taken after each practical stage (Stage 2, Stage 3, and Stage 4, for mentees' own facilities).

Data Management and Analysis

Data management procedures involved collecting quantitative data through pre- and post-intervention HIS assessments using the Kobo Toolbox. After collection, the raw data were downloaded, thoroughly cleaned to identify and correct any inconsistencies or errors, and then organized. The cleaned data were subsequently imported and analyzed using STATA version 17. Scores for HIS structure, data quality, and data use, as well as the total HIS (IR) score, were analyzed using paired t-tests to evaluate the training's effect and measure significant differences between pre- and post-intervention periods. Statistical significance was set at a p-value of less than 0.05.

Definition of Terms

Accelerated mentorship training: A training conducted over a shorter period with follow-ups of the trainees' practicing exercises at their own facilities.

PBLA (Practice-Based Learning Approach): A hands-on, intervention-focused approach in the actual work area where skill training, including mentorship skill in determining IR status of the facilities, gap identification, problem prioritization, and tailored interventions, happens simultaneously, with results measured and future plans made in collaboration with health workers in the facilities.

Model Health Facility: A facility that scores $\geq 90/100$ on HIS structure (HIS structure and resources (30%)), data quality (30%), and data use (40%) using MOH's HIS measurement standard tool.

Candidate Facility: A facility that scores 65–90/100 on HIS structure and resources

(30%), data quality (30%), and data use (40%) using MOH's HIS measurement standard tool.

Emerging Facility: A facility that scores $< 65/100$ on HIS structure and resources (30%), data quality (30%), and data use (40%) using MOH's HIS measurement standard tool.

Results

Background Characteristics of Participants

A total of 25 mentors participated in the training program, where they were equipped with skills and knowledge related to mentorship in the context of the Information Revolution (IR) in Ethiopia. Among the participants, 24 were male. Nine of the mentors were university lecturers, while 16 were health professionals from health facilities (HFs).

Table 1: Stage status and pre- and post-mentorship training IR score of the facilities

Stages	Status of facility IR	Type	Total	IR score (mean)	
				Pre-intervention	Post intervention
First	Model	HCs	2	91.5	93
		HPs	2	90.21	92.57
		Hospital	1	91	97
		Total	5		
Second	Emerging & candidates	HCs	7	50.2	75.3
		HPs	4	43.5	63
		Hospital	1	51	74
		Total	12		
Third	At their Own Facilities	HCs	21	79.03	90.3
		HPs	38	62.4	83.8
		Hospital	4	73.5	84.5
		Total	63		

Accelerated Mentorship Implementation Findings at Different Facilities

The accelerated mentorship implementation program was designed to improve HIS and

health service delivery across various facilities. Four separate steps of a structured mentorship process were used in the technique, as detailed in the Methods section. These phases were designed to improve mentors' competencies in a

variety of facility types, such as hospitals, health centers, and health posts. The mentorship process was divided into four stages: Basic theory & visual chart (in class), mentorship practice in model facilities, mentorship practice

in candidate and emerging facilities, and mentees' practice on their own facilities with remote follow-ups and final assessment of their achievement (Table 1).

Table 2: The effect of PBLA on the improvement in information revolution (IR) among mentors (Paired t-test result)

Assessment criteria	Observation	Mean	Std Dev	95%CI	
Structure after intervention	15	21.7	4.7	19.0	24.3
Structure before intervention	15	14.9	6.5	11.3	18.5
Difference	15	6.8	3.3	5.0	8.6
Pr(T > t) < 0.0001					
Data quality after intervention	15	25.4	4.5	22.9	27.9
Data quality before intervention	15	19.3	7.3	15.3	23.4
Difference	15	6.1	5.4	3.1	9.1
Pr(T > t) = 0.0007					
Data use after intervention	15	28.7	7	24.9	32.6
Data use before intervention	15	20.6	9.3	15.5	25.7
Difference	15	8.1	6	4.8	11.5
Pr(T > t) = 0.0001					
Total score after intervention	15	75.7	14.8	67.5	83.9
Total score before intervention	15	54.7	21.6	42.8	66.7
Difference	15	20.9	12.8	13.8	28.3
Pr(T > t) < 0.0001					

Mentorship Practices in the Facilities

After their first day of in-class training, mentees began practicing their mentoring techniques in model facilities during the second stage of the program. This stage offered a practical, supervised approach to mentorship in established model healthcare facilities, involving the concrete application of the theory taught in Stage One. Following this initial practical mentoring in model facilities, health centers showed a minor improvement (pre-intervention mean = 91.5, post-intervention mean = 93). This indicated a positive impact of the theoretical training on the trainers' learning of model facility mentorship techniques, establishing a foundation for mentoring in transforming emerging and candidate facilities into model ones. The

performance of health posts also increased moderately (pre-intervention mean = 90.21, post-intervention mean = 92.57), suggesting that the foundational theory enhanced their readiness for subsequent mentorship phases. Hospitals demonstrated considerable improvement (pre-intervention mean = 91, post-intervention mean = 97), likely reflecting the thorough training provided at this point. These observed practical improvements contribute to the overall significant ($P < 0.05$) improvement in HIS, as detailed in the comprehensive paired t-test analyses presented in Tables 2 and Table 3.

According to third-stage findings, the status of emerging health centers also considerably increased (pre-intervention mean = 50.2, post-intervention mean = 75.3), indicating that

practical mentorship in model health facilities enhanced their skills. Health posts in low-candidate or emerging areas also showed noticeable improvement (pre-intervention mean = 43.5, post-intervention mean = 63) after the practical mentoring experience. Hospitals demonstrated notable progress at this stage as well (pre-intervention mean = 51, post-intervention mean = 74), with mentorship raising the capacity of their offerings.

Lastly, in the third stage of their practical learning, mentees practiced in their own facilities. This phase sought to evaluate mentees' capacity to maintain their learning and successfully apply it in real-world settings. Health centers demonstrated a significant performance improvement (pre-intervention mean = 79.03, post-intervention mean = 90.3), suggesting that the mentees could successfully implement their training in their respective facilities without direct assistance. The success of the mentorship model, particularly in remote follow-up settings, was proven by the notable improvement in health posts' status (pre-intervention mean = 62.4, post-intervention mean = 83.8). Similarly, hospitals demonstrated a noticeable improvement (pre-intervention mean = 73.5, post-intervention mean = 84.5) even in a more complex and demanding environment, suggesting that accelerated mentorship had a positive impact on these establishments (Table 2).

The Effect of PBLA on IR Improvement (among mentors)

The paired t-test results demonstrated significant improvements in IR assessment criteria following the PBLA intervention. The structure score increased from a mean of 14.9 (SD = 6.5) to 21.7 (SD = 4.7), with a mean gain of 6.8 points ($p < 0.001$). Data quality improved from a mean of 19.3 (SD = 7.3) to 25.4 (SD = 4.5), showing a mean increase of 6.1 points ($p = 0.0007$). Data use rose from a mean of 20.6

(SD = 9.3) to 28.7 (SD = 7.0), with a mean improvement of 8.1 points ($p = 0.0001$). Overall, the total IR score increased significantly from 54.7 (SD = 21.6) to 75.7 (SD = 14.8), reflecting a mean gain of 20.9 points ($p < 0.0001$) (Table 2).

The effect of capacitating mentors on the improvement in HIS with their own HFs (facilities). The paired t-test results demonstrate significant improvements in HIS performance at health facilities following the PBLA-based capacitation of mentors. Structure scores increased from a mean of 21.0 to 26.1 (mean difference: 5.1, 95% CI [4.2, 6.0], $p < 0.001$). Data quality scores rose from 22.1 to 27.2 (mean difference: 5.1, 95% CI [4.1, 6.0], $p < 0.001$). Data use scores improved from 26.7 to 33.0 (mean difference: 6.3, 95% CI [5.0, 7.9], $p < 0.001$). The total HIS score increased significantly from 69.7 to 86.4 (mean difference: 16.7, 95% CI [14.3, 19.1], $p < 0.001$) (Table 3).

Discussion

The results indicate significant improvements in various aspects of the Information Revolution (IR) following the implementation of the Practice-Based Learning Approach (PBLA). Specifically, the structure score exhibited a notable increase, reflecting enhanced organizational frameworks essential for effective health information management. These structural gains are consistent with prior studies emphasizing the critical role of systems infrastructure in strengthening HIS capacity and readiness (1,4,12).

Improvements in data quality further affirm the practical impact of the PBLA intervention. The increase in data quality scores reflects enhanced skills among health professionals in collecting, maintaining, and utilizing reliable data, an outcome supported by research highlighting PBLA's ability to improve data literacy and information management in clinical environments (2,7,9). Moreover, the rise in data

use scores suggests a cultural shift toward more operational and clinical domains. This aligns with one finding that observed project-based learning stimulates authentic engagement and long-term learning application among participants (8). Similarly, one study reported

evidence-informed decision-making across that problem-based learning methods bolster critical thinking and contextual application, both necessary for effective data use in healthcare settings (10)

Table 3: The effect of capacitating mentors on the improvement in HIS with their own HF's (Paired t-test result)

Assessment criteria	observation	mean	Std Dev	95%CI
Structure after intervention	67	26.1	1.7	[25.7, 26.5]
Structure before intervention	67	21.0	4.5	[19.9, 22.1]
Difference	67	5.1	3.8	[4.2, 6.0]
$\Pr(T > t) < 0.001$				
Data quality after intervention	67	27.2	1.6	[26.8, 27.6]
Data quality before intervention	67	22.1	4.4	[21.1, 23.2]
Difference	67	5.1	3.9	[4.1, 6.0]
$\Pr(T > t) < 0.001$				
Data use after intervention	67	33.0	3.6	[32.1, 33.9]
Data use before intervention	67	26.7	7.2	[24.9, 28.5]
Difference	67	6.3	5.3	[5.0, 7.9]
$\Pr(T > t) < 0.001$				
total score after intervention	67	86.4	4.9	[85.2, 87.6]
total score before intervention	67	69.7	13.0	[66.5, 72.9]
Difference	67	16.7	9.7	[14.3, 19.1]
$\Pr(T > t) < 0.001$				

Key contributors to these improvements include PBLA's actual work environment application model, which enabled participants to apply their learning directly to facility-level challenges. This hands-on approach is supported by various studies showing that problem-based practical learning significantly enhances critical reasoning and decision-making skills in medical trainees (3,6,11). Mentorship played a pivotal role throughout the PBLA intervention. Trained mentors provided continuous, site-based support, helping mentees integrate best practices into routine workflows. This mirrors one study that reported mentorship-driven interventions improved both staff readiness and HIS performance over time (4).

Further support for PBLA's effectiveness comes from educational research. For instance, Blancia demonstrated that PBLA substantially improves scientific reasoning and organizational capacity, both essential in managing complex health information systems (7). Likewise, Knittel et al. showed that Ethiopia's IR strategy can generate measurable gains in HIS performance when supported by localized, skills-based training initiatives (12).

Finally, the collaborative learning environment fostered by PBLA enhanced peer-to-peer knowledge exchange. This dynamic was particularly impactful at the woreda and facility

levels, where group problem-solving led to innovative, context-specific solutions—an approach echoed in literature promoting case-based and team-based learning strategies (5,8).

Conclusion

The Practice-Based Learning Approach (PBLA) has significantly improved health information systems by enhancing structure, data quality, and data use. Its success, driven by effective mentorship and hands-on training, highlights the need for nationwide expansion, integration into health policies, sustained resource support, and continuous monitoring to ensure long-term sustainability and broader impact on healthcare delivery in Ethiopia.

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Ethical considerations

This study was performed following relevant guidelines and regulations and approved by the Institutional Review Board (IRB) of Hawassa University, College of Medicine and Health Sciences, Hawassa.

Data availability statement

Data supporting this study's conclusions are available upon reasonable request from the corresponding author.

Conflicts of interest

The authors declare no competing interests.

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