Health extension workers' digital literacy and their attitude towards community-level electronic health information systems in Tiro Afata Woreda, Southwest Ethiopia

Dawit Wolde Daka[1,3*], Muluemebet Abera Wordofa[2,3], Ketema Lemma Abdi[3], Woinshet Nigatu[4], Netsanet Animut[4,5], Loko Abraham[4], and Asaye Birhanu Senay[1,3]

Abstract

Background: Digital literacy and acceptability of electronic data management devices are critical factors for proper data management and use. In Ethiopia, the electronic community health information system has been introduced in 2018. However, little is known about the digital literacy and acceptability of electronic devices by Ethiopian health extension workers. This study aims to assess digital literacy and explore the acceptability of digital devices among health extension workers in Tiro Afata Woreda, Southwest Ethiopia.

Methods: A facility-based case study was conducted using quantitative and qualitative research methods from March to April 2021. Data were collected from 45 health extension workers. Seven questions (items) were used to measure digital literacy, and attitude of health extension workers was examined using 10 items. We have computed index for digital literacy and attitude toward digital technologies. Descriptive statistics was used to analyse and describe characteristics of health workers and outcome variables, and thematic analysis was performed for qualitative data.

Results: Less than half (11 or 45.8%) of health extension workers had high digital literacy, and positive attitude towards digital tools. The health extension workers mentioned that the factors including benefits and user friendliness of the digital tool, and presence of technical and material supports were facilitators to acceptability of electronic community health information system. Whereas, the overburdened responsibilities of the health extension worker beyond health extension program activities was an impediment to acceptability and proper use of eCHIS.

Conclusions: The health extension workers level of digital literacy and attitude towards mobile applications was relatively low. Hence, the implementation of community-level electronic health information systems should take into consideration the digital literacy, and the factors that impede acceptability of digital tools. [*Ethiop. J. Health Dev.* 2022; 36(SI-2)]

Introduction

Worldwide effort has been made to enhance healthcare through the use of technologies, including application of digital technologies, that help improve data management (1). Among the wide range of digital health initiatives piloted in response to specific health challenges of low-and-middle-income countries, initiatives that aimed to enhance health information system is amongst them (2–4).

Digital literacy of health workers is critical to properly implement digital technologies in the health system. Digital literacy in health is the ability to seek, find, understand and appraise health information from electronic resources and apply such knowledge to address or solve a health problem (5). A study that assessed the health workers digital literacy level in terms of their confidence in using information technologies in Australia revealed that majority of health workers (70-80%) had a high digital literacy and one-fifth reported anxiety related to the use of information systems (6). Another study conducted in an Iranian hospital, which assessed their ability in protecting privacy, operational skills, navigation and information searching skills, reported that the digital literacy level of health workers is desirable, and digital literacy is related to education and job category of health workers (7). While a study done in Ethiopia among healthcare providers in the public centers showed that their basic digital competency is relatively low. This study reported that the characteristics of health workers (sex, educational status, profession type, monthly income and years of experience) are predictors of digital literacy (8).

The level of health workers digital literacy influences acceptability and effective use of digital technologies (6,9). Community health workers find it difficult to adopt and use digital health solutions due to lack of trainings on new digital tools, weak technical support, issues of internet connectivity, and other administrative related challenges (10,11). A study conducted in health facilities in rural Africa revealed a low level of computer knowledge but positive attitude among rural health workers to use digital technologies (12). This impedes successful uptake of electronic clinical decision support system.

Though digital health technologies are a relatively recent phenomenon in Ethiopia, their potential role in

---

[1] Department of Health Policy and Management, Public Health Faculty, Institute of Health, Jimma University, Ethiopia

[2] Department of Population and Family Health, Public Health Faculty, Institute of Health, Jimma University, Ethiopia

[3] Capacity Building and Mentorship Program (CBMP), Jimma University, Jimma Ethiopia

[4] Digital Health Activity (DHA), Addis Ababa, Ethiopia

[5] The Palladium Group, Washington DC 20004, USA

*Corresponding Author email-dawit.daka86520@gmail.com; https://orcid.org/0000-0001-5465-6345

clinical and public health practices are highly visible (13). Following the initiation of reformed health management information system in 2008, various digital technologies have been introduced to support routine data management practices in health care institutions (14).

The Ethiopian government initiated the community health information system (CHIS) in 2010 as part of the national health management information system reform and rolled it out after 2 years. The Community Health Information System (CHIS) is a family-centered health information system designed for the Health Extension Worker (HEW) to manage and monitor her work in educating households and delivering an integrated package of promotive, preventive, and basic curative health service to families. CHIS is implemented as part of the Health Extension Program (HEP), which is introduced in 2003 (15). The implementation of CHIS in the last couple of years revealed that the system has played huge role in standardizing and simplifying data management and use practices. However, the vast component of HEP packages of services coupled with the data burden of HEWs has complicated the data management practices at community level. These reasons have called the Government of Ethiopia (GoE) to digitalize CHIS. The electronic community health information system (eCHIS) has been introduced in 2018, and the implementation started in 2019 in pilot woredas of four agrarian regions of Ethiopia. Currently, eCHIS is rolled out in more than 7000 health posts (14,16).

Assessing the digital literacy of health workers and their attitudes to information systems has paramount importance in improving health service delivery and health outcomes. Digital competent health worker is capable to providing efficient and effective healthcare to patients (17). Therefore, this case study aimed to assess digital literacy and determine acceptability of community-level electronic information system (eCHIS) among the health extension workers in Tiro Afata Woreda, Southwest Ethiopia.

Methods and Materials
Study setting and period
The study was conducted in Tiro Afata Woreda, which is a learning woreda of electronic community health information system. The woreda was selected as a learning site by the Oromia Region Health Bureau and the Jimma Zone Health Office to implement eCHIS, conduct research and replicate best practices to other similar settings.

Tiro Afata is one among the 21 woredas in Jimma Zone and located 330 kilometers southwest of Addis Ababa. The woreda has 5 health centers, 25 health posts and 1 primary hospital providing health promotive, disease preventive, and curative services to the catchment population. The study was conducted from May 15-25, 2021. The map of the study area was presented in Figure 1.
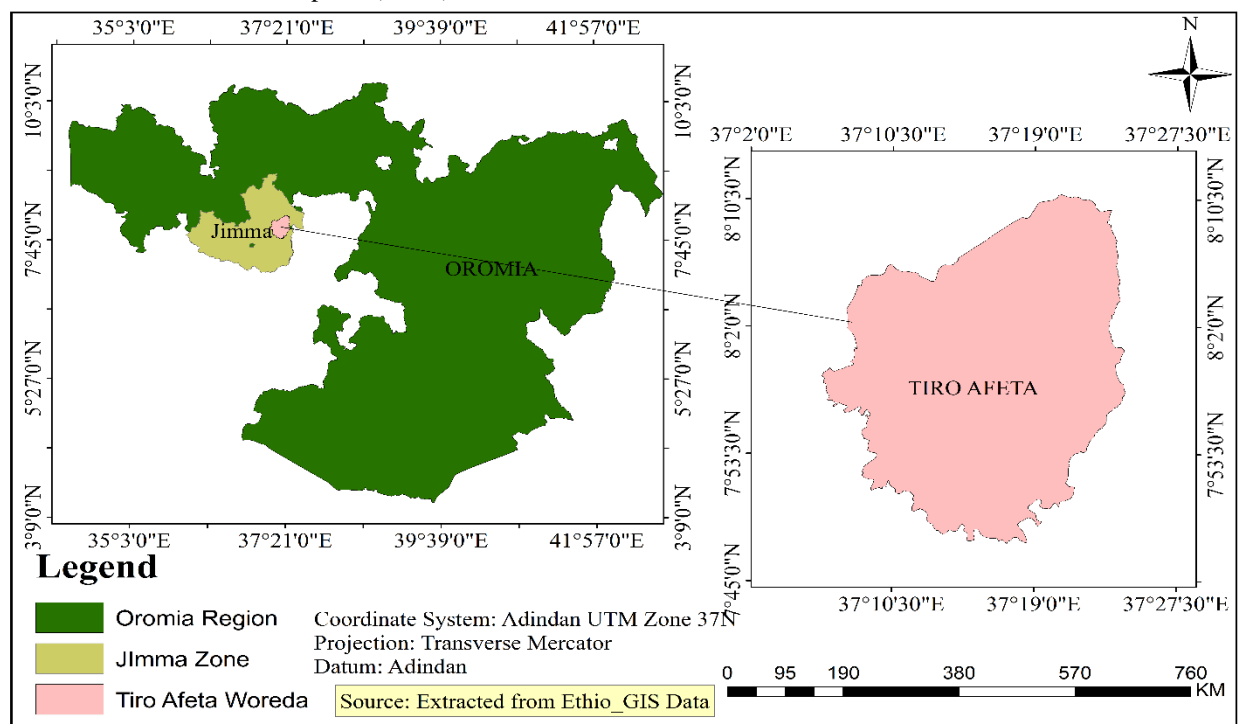

Figure 1. Map of the study area

Study design and participants
Facility-based case study was conducted. All health extension workers presented at health posts on the date of survey were included in the quantitative survey and one purposefully selected health extension worker per health post was included in qualitative research.

Data collection
A structured questionnaire was used to collect data related to digital literacy of health extension workers, which was prepared based on the European Commission Digital Competence Framework (18–20).

The questionnaire comprised sections on background characteristics of HEWs, basic knowledge on Information Communication Technology (ICT) and attitude towards digital devices. Questionnaire was translated to Afan Oromo by expert translator and back translated to English by independent expert to ensure consistency. Then the questionnaire was uploaded on Open Data Kit (ODK) for data collection.

Data collectors were health informatics professionals with a qualification of diploma and above, and they were supervised by public health professionals with qualification of master's degree and above. Data collectors and supervisors were trained for three days on how to fill questionnaire, data collection techniques, and research ethics. Supervisors monitored the overall data collection process and provided feedback on daily basis.

Study variables
The outcome variable was digital literacy or competency and acceptability of digital tools. Digital literacy was measured using seven items each having Likert scale ranging from 1=strongly disagree to 5=strongly agree. The items were: 'I know how to switch on and switch off a tablet or smartphone', 'I know how to navigate a mobile app', 'I know to communicate messages (text or image or audio or video format) with a client (a friend or other people)', 'I know to capture and edit image files', 'I know data safety and security measures and have due regard to reliability and privacy', 'I know how to use and share personally identifiable information while being able to protect oneself and others from damage', and 'I am able to identify technical problems when operating mobile apps and solve them'. The health extension workers who responded to the median or above the median value were regarded as having 'high digital literacy'. Those who responded below median value were identified for having 'low digital literacy'.

Acceptability of digital tools was measured using 10 attitude items each having a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The items were: 'I believe tablets and smartphones are useful in my everyday (non-work related) life', 'I believe mobile apps can assist me in my work at the health post', 'I believe I would be able to use mobile app to provide patient care or health services to clients', 'I believe I would be able to learn how to use mobile app', 'I believe mobile apps can support my decision making during healthcare provision', 'I think using mobile apps would increase my workload', 'I think the use of mobile apps would improve quality of care', 'I do not have time to learn how to use mobile apps', 'I do not have time to use mobile apps', and 'Overall, I believe using mobile apps in patient care is a good idea'. For the negative items, a reverse coding was undertaken. Those health extension workers who

responded above the median value were categorized as having 'high acceptability' and those below the median value as having 'low acceptability' of mobile applications.

Level-3 HEWs: are those who graduated with a certificate after a one-year pre-service trainings on the 17 packages of Health Extension Program.

Level-4 HEWs: are those who graduated with diploma after one-year additional education at a technical college.

Data processing and analysis
The completeness and consistency of data values were checked, and exported to SPSS version 21 for analysis. The characteristics of HEWs, and the main outcome variables (digital literacy and acceptability of mobile applications) were analyzed. Percentage was computed for each variable.

Qualitative data recorded on audio tape were transcribed to original language and translated to English. Coding was done to highlight specific themes or categories as a preliminary analysis. The themes that emerged after analysis were cross-checked. Finally, a rich description of the barriers and facilitators of digital devices acceptability was written. Validation was sought by ensuring the reliability of the findings and by doing triangulation with the quantitative findings.

Ethical consideration
Ethical approval was obtained from Jimma University Ethics review board (Reference no. IHRPGD/561/22; 26th April 2021) and a study permission letter from Jimma Zone Health Department. Informed written consent was taken from study participants. All computer-based data were password secured. Data was not to be shared to third person.

Results
A total of 24 health extension workers participated in the quantitative interviews. Twenty-two (91.7%) HEWs have completed their 10th grade education and 5 (62.5%) had Level-3 (certificate) trainings. Average service experience of HEWs was 8.52 years (SD 4.65) with minimum and maximum service experiences of 1.3 year and 17 years, respectively.

Twenty-one HEWs participated in the qualitative interviews (Table 1). Twenty (95%) HEWs have completed 10th grade and 18 (86%) had a Level-3 training. The minimum age of HEWs was 21 years and the maximum age was 35 years. The mean age was 26 years (SD 2.7). Their service experience ranged from 1.5 years to 17 years. Seventeen (81%) HEWs have received CHIS training and out of these seven (41%) were trained in the last 12 months of survey period.

Table 1. Characteristics of HEWs at Tiro Afata Woreda, March to April 202 (N=21)

Characteristics	Frequency(%)
Age in years	
20-24	6 (29.0)
25-29	11 (52.0)
30-34	3(14.0)
>34	1 (5.0)
Training level	
Level-3(certificate)	18(85.7)
Level-4(Diploma)	3 (14.3)
Service year	
< 5	7 (33.0)
5-10	6 (29.0)
>10	8 (38.0)
Trained with community health information system	
Yes	17(81.0)
No	4(19.0)
Training period[a]	
Within 12 month of the survey date	7 (41.0)
Before 12 months of survey date	10 (59.0)

[a]*Out of the HEWs trained with CHIS (n=17)*

Digital literacy

The majority of the health extension workers had high digital literacy when it comes to switching on and switching off tablets (15 or 62.5%), navigating mobile application (15 or 62.5%), communicating message to a client (17 or 70.8), capturing and editing image files (21 or 87.5%), and using and sharing personally identifiable information (16 or 66.7%). All of the HEWs knew identifying and solving technical problems (24 or 100%). Overall, less than half (11 or 45.8%) of health extension workers had high digital literacy or competency of digital devices (Table 2).

Table 2. HEWs digital literacy at Tiro Afata Woreda, March to April 2021 (N=24)

Digital literacy items	Frequency	Percent
I know how to switch on and switch off a tablet or smartphone		
High	15	62.5
Low	9	37.5
I know how to navigate a mobile app		
High	15	62.5
Low	9	37.5
I know to communicate (text or image or audio or video formats) messages with a client (a friend or other people)		
High	17	70.8
Low	7	29.2
I know to capture and edit image files		
High	21	87.5
Low	3	12.5
I know data safety and security measures and have due regard to reliability and privacy		
High	13	54.2
Low	11	45.8
I know how to use and share personally identifiable information while being able to protect oneself and others from damage		
High	16	66.7
Low	8	33.3
I am able to identify technical problems when operating mobile apps and solve them		
High	24	100
Low	0	0

Overall digital literacy		
High	11	45.8
Low	13	54.2

Acceptability of digital tools

Majority of the health extension workers believe that they are able to use mobile application to provide patient care (18 or 75%), mobile applications support their decision-making during healthcare provision (20 or 83.3%), and mobile application improve the quality of healthcare (20 or 83.3%). All of the health extension workers believe that they are able to learn how to use mobile applications (24 or 100%). However, eight out of ten health extension workers think that using mobile applications increases workload (21 or 87.5%), don't have time to learn how to use mobile applications (20 or 83.3%), and don't have time to use mobile applications (16 or 66.7%). Overall, less than half (11 or 45.8%) of the health extension workers had high acceptability of mobile applications (Table 3).

Table 3. Acceptability of digital tools by HEWs

Acceptability items	Frequency	Percent
I believe tablets and smartphones are useful in my everyday (non-work related) life		
Agree	12	50.0
Disagree	12	50.0
I believe mobile apps can assist me in my work at the health post		
Agree	12	50.0
Disagree	12	50.0
I believe I would be able to use mobile app to provide patient care or health services to clients		
Agree	18	75.0
Disagree	6	25.0
I believe I would be able to learn how to use mobile app		
Agree	24	100.0
Disagree	0	0.0
I believe mobile apps can support my decision making during healthcare provision		
Agree	20	83.3
Disagree	4	16.7
I think using mobile apps would increase my workload		
Agree	21	87.5
Disagree	3	12.5
I think the use of mobile apps would improve quality of care		
Agree	20	83.3
Disagree	4	16.7
I do not have time to learn how to use mobile apps		
Agree	20	83.3
Disagree	4	16.7
I do not have time to use mobile apps		
Agree	16	66.7
Disagree	8	33.3
Overall, I believe using mobile apps in patient care is a good idea		
Agree	14	58.3
Disagree	10	41.7
Overall acceptability of digital devices		
Agree	11	45.8
Disagree	13	54.2

Determinants of eCHIS acceptability
Theme 1: Enablers for eCHIS acceptability
HEWs believe that eCHIS has a lot of advantages. It enables them to record and access data anytime and anywhere and facilitates their work whenever they provide home to home and outreach services. They also mentioned that eCHIS improves data quality, health service quality, and reduce work burden.

In support to this, a 28-year-old HEW said:

"Most of the time we carry folders and visit households to provide services. In my opinion using tablets enable us to easily register or update household information without carrying folders and field books. This will simplify our work particularly related to carrying folders, searching for households who changed their location, or whose house number becomes invisible. Once a household is registered in the tablet, it cannot be missed forever. eCHIS has made our duty easier". [P_9]

Another HEW, who has Level-3 certificate and who was 30-years old, responded:

"I didn't have eCHIS training, but as I heard from my colleagues, tablets correct HEWs activities and decisions. If you make an error, it will show red color and thus you will ask what to do and correct it. Otherwise, it will not allow you to use it. The other point is, whenever working with the tablet, there is no need to worry about registering, collecting data and reporting. I think it will simplify HEWs duty." [P_{10}]

HEWs believe that eCHIS improves the quality of data and help them achieve the objective of performance evaluation. With this regard, a 36-year-old HEW said:

"I was very happy when I heard that the approach has been changed to digital. Because, it is linked to the region, and every activity I do and submit in the tablet will be seen at the regional level. This will help identify HEWs who discharge her duties properly and those who do not. I took it as a divine intervention. I am very happy that I will be judged by my performance, not by personal feeling or by talking too much. It has motivated me to genuinely carry out my duty, as everybody can see my performance". [P_{11}]

"eCHIS implementation has a lot of benefits. For instance, it shows the actual performance. It improves our data management by capturing all required individuals' and households' health related information, and helps to produce quality data that is free from manipulation. It is very simple to carry tablet instead of folders while we go home to home and record all necessary information, we can access all recorded data at any time and these things lead us to increase service access and community satisfaction". [P_{13}: 28-years old HEW]

When comparing it with the paper-based CHIS, the HEWs believe that the electronic CHIS (eCHIS) has acceptance by the HEWs. This is because eCHIS enables the HEWs to perform their activities at anytime and anywhere. The HEWs can easily carry tablets and provide home-to-home services using eCHIS, and they don't need to carry folders.

"Our duty is mostly field based, and therefore we have an opportunity to implement it by doing home-to-home visits. I am personally using eCHIS very well, and I am happy to use it." [P_{11}: Level-3 35-years old HEW]

Theme 2: Barriers for eCHIS acceptability

The challenges in implementing eCHIS were lack of electricity and internet connectivity. The health extension workers have also mentioned that too much workload and lack of attention or support from supervisors hinders the proper implementation of eCHIS. HEWs don't fear to use tablets or eCHIS, but as a challenge they mentioned backlog data entry.

"Sure, I have accepted eCHIS. Currently we are updating folders. To save our time we are transferring the data from the folder to the tablet immediately after the training. We are doing the transfer even by taking the folders at our home because it must be done urgently. eCHIS is better than paper-based CHIS because tablet is always with you and thus, can be used at any time. This is an opportunity. The problem, from my previous experience with CHIS, was lack of attention or focus and supervisions. These are very essential for the proper implementation of eCHIS". [P_9: 10th grade completed 28-years old HEW]

"The challenge eCHIS might be lack of time (because of workload from activities or responsibilities given by the Kebele), lack of connectivity and electricity around health post. This hinders proper implementation of eCHIS." [P_7: 12th grade completed 28-years old HEW]

"In my opinion eCHIS has high acceptance among health extension workers. Because, they think that they would be familiar with the technology and it helps them simplify their day to day activities. But, they fear that backlog data entry to the tablet may be difficult task to them". [P_{13}: Level-4 28-years old HEW]

HEWs think that the continual acceptability of eCHIS can be ensured if proper supports and continuous monitoring is provided from supervisors, and if the workload from kebele are minimized. They suggested a person that provides them with guidance and technical supports should be assigned whenever needed.

Discussion
This study was aimed to assess digital literacy of the HEWs and acceptability of mobile applications or digital devices. The study revealed that less than half of the health extension workers had digital literacy and acceptability of mobile applications. The factors that affected mobile applications acceptability were perception level of HEWs about the benefits of the application, presence of technical and material supports, and the amount of work given by the kebele to be carried out by the HEWs in addition to routine HEP activities.

Basic knowledge and favorable attitude of digital devices and tools were critical for effective implementations of electronic health information systems. The present study revealed that less than half of the HEWs had high digital literacy, and positive attitude towards digital devices. Though not in a similar setting, a study done among healthcare providers working in public health centers (8), and the medical record unit workers in Northwest Ethiopia has reported a relatively low level of basic digital competency (21). Similarly, a study done in rural primary health facilities in Burkina Faso, Ghana, and Tanzania has indicated only few health workers had a good digital literacy (22). Digital devices and data security skills of health workers in Low- and Middle-Income Countries (LMICs) is low and requires need based interventions to improve data management and use practices (23). The lack of digital literacy is the most common barrier to adoption of electronic tools (24), and this requires improving digital competency of health workers.

In the study area the determinants of community-level electronic information system (eCHIS) acceptability were perceived benefits of the mobile application, access to electricity and internet connectivity, presence of technical and material supports, and the workload from kebele the HEWs need do in addition to their routine work. Similar finding was reported in other studies elsewhere in that lack of managerial support, lack of ICT competency, and lack of ICT resources are barriers to adoption and use of electronic health records and health information technologies (25–28). Perceived factors including perceived usefulness of HIT and perceived ease of use of health technology also determines use of digital devices (29). As much as the digital literacy level of frontline health workers, the presence and full functionality of infrastructure that supports the implementation of digital tool (technologies) is critical factor for effective use of digital devices for data management and service delivery (30).

This study is done in a small sample of health extension workers and generalization can't be sought. However, we believe that the problem of digital literacy and acceptability of digital tools reported in the study can reflect the situations in similar settings in the country.

Conclusions
This study concluded that digital literacy of health extension workers and their attitude towards mobile based applications were relatively low in the study area. The digital literacy level of health extension workers coupled with infrastructure barriers, and workload of tasks from local government administration that HEWs are obliged to do impede adoption and use of electronic community information system in the study area. While the perceived benefits and usefulness of mobile applications are enablers for the use. Therefore, community-level electronic information systems (eCHIS) implementation should consider the digital literacy and attitude of health extension workers, and infrastructural and technical support.

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

Data sharing statement
The original data of this research are available from the corresponding author in SPSS software.

References
1. Al-Shorbaji N. *Improving Healthcare Access through Digital Health: The Use of Information and Communication Technologie*s. In: Agrawal A, Kosgi S, editors. Rijeka: IntechOpen; 2021. p. Ch. 21. Available from: https://doi.org/10.5772/intechopen.99607
2. Long L, Pariyo G, Kallander K. *Digital Technologies for Health Workforce Development in Low- and Middle-Income Countries: A Scoping Review*. Glob Heal Sci Pract. 2018;6(Supplement 1):1–8.
3. Lewis T, Synowiec C, Lagomarsino G, Schweitzer J. *E-health in low- and middle-income countries: findings from the Center for Health Market Innovations*. Bull World Health Organ. 2012;90:332–40.
4. Labrique AB, Wadhwani C, Williams KA, Lamptey P, Hesp C, Luk R, et al. *Best practices in scaling digital health in low and middle income countries*. Global Health. 2018;14:103.
5. Thomas J, Barraket J, Wilson CK, al. et. *Measuring Australia's digital divide: the Australian digital inclusion index 2019* [Internet]. RMIT University ; 2019. Available from: https://apo.org.au/node/255341
6. Kuek A, Hakkennes S. *Healthcare staff digital literacy levels and their attitudes towards information systems*. Health Informatics J [Internet]. 2019 Apr 15;26(1):592–612. Available from: https://doi.org/10.1177/1460458219839613
7. Alipour J, Payandeh A. *Assessing the level of digital health literacy among healthcare*

workers of teaching hospitals in the southeast of Iran. Informatics Med Unlocked [Internet]. 2022;29:100868. Available from: https://www.sciencedirect.com/science/article/pii/S2352914822000223

8. Shiferaw KB, Tilahun BC, Endehabtu BF. *Healthcare providers' digital competency: a cross-sectional survey in a low-income country setting*. BMC Health Serv Res [Internet]. 2020;20(1):1021. Available from: https://doi.org/10.1186/s12913-020-05848-5

9. Khare A, Jain K, Laxmi V, Khanna P. *Impact of Digital Literacy Levels of Health Care Professionals on Perceived Quality of Care*. iproc [Internet]. 2022;8(1):e41561. Available from: https://www.iproc.org/2022/1/e41561

10. Owoyemi A, Osuchukwu JI, Azubuike C, Ikpe RK, Nwachukwu BC, Akinde CB, et al. *Digital Solutions for Community and Primary Health Workers: Lessons From Implementations in Africa* [Internet]. Vol. 4, Frontiers in Digital Health . 2022. Available from: https://www.frontiersin.org/articles/10.3389/fdgth.2022.876957

11. Feroz AS, Khoja A, Saleem S. *Equipping community health workers with digital tools for pandemic response in LMICs*. Arch Public Heal [Internet]. 2021;79(1):1. Available from: https://doi.org/10.1186/s13690-020-00513-z

12. Sukums F, Mensah N, Mpembeni R, Kaltschmidt J, Haefeli WE, Blank A. *Health workers' knowledge of and attitudes towards computer applications in rural African health facilities*. Glob Health Action [Internet]. 2014 Dec 1;7(1):24534. Available from: https://doi.org/10.3402/gha.v7.24534

13. Manyazewal T, Woldeamanuel Y, Blumberg HM, Fekadu A, Marconi VC. *The potential use of digital health technologies in the African context: a systematic review of evidence from Ethiopia*. npj Digit Med [Internet]. 2021;4(1):125. Available from: https://doi.org/10.1038/s41746-021-00487-4

14. Ethiopian MOH. *Information Revolution Roadmap*. 2016.

15. Kare Chewicha and Tariq Azim. *Community Health Information System for Family-centered Health Care: Scale-up in Southern Nations, Nationalities and People's Region*. Ethiopia Ministry of Health Quarterly Health Bulletin. 2013;5(1):49–53.

16. Ethiopian MOH. *Health Sector Transformation Plan II: 2020/21-2024/25*. Vol. 25. 2021.

17. Nazeha N, Pavagadhi D, Kyaw BM, Car J, Jimenez G, Tudor Car L. *A Digitally Competent Health Workforce: Scoping Review of Educational Frameworks*. J Med Internet Res [Internet]. 2020 Nov 5;22(11):e22706–e22706. Available from: https://pubmed.ncbi.nlm.nih.gov/33151152

18. Carretero S, Vuorikari R, Punie Y. *The Digital Competence Framework for Citizens With Eight* [Internet]. Publications Office of the European Union. 2017. 48 p. Available from: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-21-digital-competence-framework-citizens-eight-proficiency-levels-and-examples-use

19. Shiferaw KB, Tilahun BC, Endehabtu BF. *Healthcare providers' digital competency: a cross-sectional survey in a low-income country setting*. BMC Health Serv Res. 2020;20(1):1021.

20. Oo HM, Htun YM, Win TT, Han ZM, Zaw T, Tun KM. *Information and communication technology literacy, knowledge and readiness for electronic medical record system adoption among health professionals in a tertiary hospital, Myanmar: A cross-sectional study*. PLoS One [Internet]. 2021;16(7):e0253691. Available from: http://dx.doi.org/10.1371/journal.pone.0253691

21. Meseret M, Tesfu M, Alemayehu M, Abebe Y. *Knowledge and Attitude Towards ICT Among Medical Record Unit Workers, Northwest Ethiopia, 2018: Institutional Based Cross-Sectional Study*. Int J Wirel Commun Mob Comput. 2020;8(1):1–8.

22. Sukums F, Mensah N, Mpembeni R, Kaltschmidt J, Haefeli WE, Blank A. *Health workers' knowledge of and attitudes towards computer applications in rural African health facilities*. Glob Health Action. 2014;7:24534-.

23. Koivu A, Mavengere N, Ruohonen MJ, Hederman L, Grimson J. *Exploring the Information and ICT Skills of Health Professionals in Low- and Middle-Income Countries* BT - Stakeholders and Information Technology in Education. In: Brinda T, Mavengere N, Haukijärvi I, Lewin C, Passey D, editors. Cham: Springer International Publishing; 2016. p. 152–62.

24. Yehualashet DE, Seboka BT, Tesfa GA, Demeke AD, Amede ES. *Barriers to the adoption of electronic medical record system in ethiopia: A systematic review*. J Multidiscip Healthc. 2021;14:2597–603.

25. Khalifa M. *Barriers to Health Information Systems and Electronic Medical Records Implementation: A Field Study of Saudi Arabian Hospitals*. Procedia Comput Sci [Internet]. 2013;21:335–42. Available from: https://www.sciencedirect.com/science/article/pii/S1877050913008375

26. Ajami S, Arab-Chadegani R. *Barriers to implement Electronic Health Records (EHRs)*. Mater Sociomed. 2013;25(3):213–5.

27. Gesulga JM, Berjame A, Moquiala KS, Galido A. *Barriers to Electronic Health Record System Implementation and Information Systems Resources: A Structured Review*. Procedia Comput Sci [Internet]. 2017;124:544–51. Available from: https://www.sciencedirect.com/science/article/pii/S1877050917329563

28. Agarwal S, Zan T. Use of information and communication technologies (ICT) in community health programmes [Internet]. Lankester T, Grills N, Lankester T, Grills NJ, editors. *Setting up Community Health and Development Programmes in Low and Middle Income Settings*. Oxford University Press; 2019. p. 0. Available from:

https://doi.org/10.1093/med/9780198806653.003.0026

29. Bundala William. *Adoption of Technology on Improving Community Health Centres Services: A case of Community Health Workers in Nyamagana District*. A Dissertation Submitted in Partial Fulfillement of the Requirements for the Degree of Master of Social Work of the Open Unive. Vol. 2507. 2020.

30. Lankester T, Grills N, Agarwal S, Zan T. *Use of information and communication technologies (ICT) in community health programmes*. In Oxford, UK: Oxford University Press; 2019. Available from: https://oxfordmedicine.com/view/10.1093/med/9780198806653.001.0001/med-9780198806653-chapter-26