

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH



**DIGITAL HEALTH LITERACY AND PRACTICE AMONG PHYSICIANS
IN GOVERNMENT TEACHING HOSPITALS OF ADDIS ABABA: A
CROSS-SECTIONAL STUDY**

BY

SEMHAL AREFINE (BSc)

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ADDIS ABABA, ETHIOPIA

**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF HEALTH SYSTEM MANAGEMENT AND HEALTH
POLICY**

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June 2025

ADDIS ABABA, ETHIOPIA

Declaration

By my signature below, I declare that this thesis titled **“Digital Health Literacy and Practice among Physicians in Government Teaching Hospitals of Addis Ababa: A Cross-Sectional Study”** is my original work which have never been presented in this or other Universities and all source materials included in this thesis are given recognition through appropriate citation. This thesis is to be submitted for examination after approval from advisors and Department of Health System Management and Health Policy, School of Public Health, College of Health Science, Addis Ababa University. :

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Approval Sheet

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Abbreviations

AA	Addis Ababa
AI	Artificial Intelligence
AMA	American Medical Association
AOR	Adjusted Odds Ratio
CI	Confidence Interval
COR	Crude Odds Ratio
DH	Digital Health
DHIS	Digital Health Information System
DHL	Digital Health Literacy
E-CHIS	Electronic Community Health Information System
eHealth	Electronic Health
EHR	Electronic Health Record
E-LMIS	Electronic Logistic Management Information System
EMR	Electronic Medical Record
GP	General Practitioner
HP	Health Professionals
HSTP	Health Sector Transformation Plan
ICT	Information and Communication Technology
mHealth	Mobile Health
OECD	Organization for Economic Cooperation and Development
SPSS	Statistical Packages for Social Sciences
UK	United Kingdom
WHO	World Health Organization

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Abstract

Background: Digital health is becoming crucial for improving health outcome and providing patient centered care. World nations are integrating digital health policies and strategies to achieve digitalization of health care. However utilization and successful adoption of these technologies require physicians' literacy, but there is limited study on digital health literacy of physicians and its influence on digital health practices.

Objective: This study aimed to assess the digital health literacy and practice among physicians in government teaching hospitals in Addis Ababa.

Methods: A cross-sectional study was conducted from March to April 2025. A representative quantitative data from government teaching hospitals in Addis Ababa collected through structured questionnaire among 394 physicians. Data was entered and cleaned in excel then exported to SPSS 26.0 for analysis. Descriptive statistics, Binary and multivariable logistic regression were carried out and *P* value of < 0.05 , adjusted odds ratio (AOR) with 95% confidence interval (CI) was used to determine variables significantly associated with digital health practices.

Result: In this study, out of all respondents 50.3% of physicians had high digital health practice and digital health literacy of 58.2%. Higher digital health literacy (AOR=2.05 95% CI: 1.27-3.3), limited access to digital tools at workplace (AOR= 0.18, 95% CI: 0.06-0.5), training on digital health (AOR=2.05, 95% CI: 1.16-3.6), being general practitioner (AOR= 0.26, 95% CI: 0.1-0.6) were found to be significant factors associated with digital health practice.

Conclusion: Although more than half of the physicians had high digital health literacy, the practical use in clinical service was low and limited to facility based digital tools and technologies. To enhance digitalization of health care, for future adoption and implementation, stakeholders including Ministry of Health, Ministry of Education and health facilities should take appropriate measures in implementing guidelines, platforms and strategies for physicians with pre-service training and in-service professional development programs.

Key words: Digital health, Digital health literacy, Digital health practice, Physicians, Digital health utilization, eHealth

1. Introduction

1.1. Background

As the world is moving at a greater speed regarding technology the demand for digitalized health system has increased and it has become a digital determinant of health service. In regard to this the World Health Organization put forward a Global Strategy on Digital Health 2020-2025 with the aim of integrating digital health into the health system through the development and use of digital health technology for all consumers and providers. Digital health (DH) evolves on using digital technologies such as electronic health (eHealth), mobile health (mHealth), smart devices, and advanced technologies such as artificial intelligence (AI), robotics and genomics to improve health(1).

Digital health technologies has enhanced the quality, accessibility, affordability and equity of the health care service consumers get and improved the efficiency of health providers with better and accurate diagnosis and treatment(2,3). However adoption and implementation has been easier in developed countries where digitalization phase of their health system has been going for almost six decades and advanced tool and solution like internet of things, robotics and AI are used in providing health care services(4). Meanwhile developing countries are still facing different challenges such as cost, adequate coverage, and human resource constrain, connectivity, sustainability and collaboration affecting the full practice of digitalize health(5,6). For this, improvement in infrastructure, training and assessment on new digital health technologies is required(7,8).

The WHO's framework for implementing the global strategy on digital health in Africa set a target of 60 percent of member states in Africa to have a mechanism for them to produce a workforce ready for digital health by 2030; emphasizing on strengthening digital health literacy as a key factor for sustainable healthcare improvement and practice(9). Digital health literacy (DHL) as defined by WHO is “the ability to search, find, understand and evaluate health information from electronic sources and to use the knowledge acquired to solve health problems”(10).

Ethiopia has developed a National Digital Strategy 2020-2025 for the digital transformation of the country along with Digital Health Blueprint by Ministry of Health and included innovative digital health interventions as core element of the health system transformation plans over the years through the implementation of Information Revolution Roadmap, in order to address the challenges faced, to achieve universal health coverage and health related sustainable development goals. Other standards have also been implemented such as National Data Access and Sharing Guideline, eHealth Architecture and electronic record standards. Ministry of Health is also working on advancing health information systems such as Electronic Health Record (EHR), Electronic Logistic Management Information System (e-LMIS) and Electronic Community Health Information System (e-CHIS) and upgraded its data center for local system. Regardless of the effort, inconsistent and poor digital health infrastructure, weak governance, limited health workforce capacity and literacy plays a major role as barriers(11,12).

1.2. Statement of the Problem

From the rise of 5G network to the growth of health care data; with 2.5 trillion megabytes added daily(13). But also digital transformation as a way to achieve universal health coverage and health related sustainable development goals there is a need to the practical application of digital tools and technologies in the health system which requires medical professionals digital literacy including computer and technology(14). This knowledge on digital health increases the health practitioners intention to use digital tools and technologies in providing service(15).

Even though the use of digital tools like the electronic medical record had resulted in 11% reduction in mortality in Ethiopia(16), mobile internet connection reaching 65% and introduction of 5G network with increment in 4G coverage and 3760 health facilities connected to Virtual Private Network (VPN) and 3G wireless networks by the health Net and ICT network infrastructure to facilitate digitization(11), The practice of it by the health professionals in Ethiopia still face obstacles(17). Recent studies done during the COVID-19 emphasize that digital literacy and infrastructure limits the effective utilization of digital platforms even though willingness to use was high among the health professionals(18).

Additionally, most studies regarding DHL in Ethiopia were greatly limited to the context of the pandemic response where health care relied heavily on digital technologies(17), making it hard to assume its association with the wider and long term integration of digital tools into routine

health care practice and explore on how these skills translate to effective practice. This creates a gap in understanding the practical utility of DHL among physicians in Ethiopia on their day to day roles and whether it contributes to improved healthcare delivery.

Furthermore, regardless of its importance, studies that examine the association of DHL among health professional, specifically physicians and its practical application on the health services in Ethiopia including urban setting like Addis Ababa still remains under explored(19). Therefore there is a need for empirical research that investigates the current levels of DHL among health professionals in Addis Ababa, as well as its influence on their digital health practices. It also remains unclear on what extent the goals of Ethiopian national digital health strategies are being met in relation to health professionals' competencies and practices regardless of the ongoing effort by government, and if health professionals only possess digital literacy without corresponding it to digital health practice in this region; as the effectiveness of these digital interventions depends on healthcare professionals confidence and ability to use them(20). Therefore this study was conducted to assess current status of digital health literacy and practice and their association among physicians in Addis Ababa teaching government hospitals.

1.3. Significance of the Study

In order to achieve the national strategy of digital health by 2025; all stakeholders should work on effective implementation of digital health and this can't be achieved without the knowledge, skill and acceptance and practice of it by those providing health services. Future healthcare demands for a physician that could handle data, help patients to navigate through health information and integrate digital skill into the service they provide. As health professionals with limited skills can impact the engagement with patients, be prone to medical errors and cause inefficiencies in patient care.

The study will help to evaluate the role of digital health literacy of health professionals in Addis Ababa and its impact on the actual practice in order to understand what priority areas to identify in order to sustain the implementation and adoption of digital health technologies and effective digital health practice, provide insight for policy makers to establish policies and improve, existing strategies, Ministry of Health and health facilities to strengthen digital health infrastructure and provide targeted training but also to have the educational system to produce health workforce that keeps up with the growing technological innovations.

2. Literature Review

2.1. Digitalization of Health

The process of health sector digitalization as compared to other industries have been slow even for the developed countries where only 2.7% of revenue from the health care industry is spent on information technology(1,21) but the COVID-19 pandemic has in a way accelerated it worldwide with more countries developing national strategy for digital health and application of digital tools to health care.

The use of these technologies improves patient care with patient centered care reducing errors and cost and increase productivity of health professionals. Additionally it create health equity throughout the world(21,22). Health information management system created a foundational shift for digitalization of health by facilitating efficient data collection, storage, sharing, management and utilization in the health system. Even though challenges of interoperability, usage and cost for implementation are there it has a vital role in providing data driven patient care and digitalization of health care(23).

The implementation of digital health innovations had been different for developed and developing nations attributed to multiple factors such as infrastructure, governance and socioeconomic conditions. While governments of different developed countries have spurred digital health with increased usage. Including the United States spending around 10.7 billion dollar in developing advanced digital health infrastructures and technologies like AI in diagnosis and countries like Switzerland and the United Kingdom (UK) where 95% of the health facilities have integrated EHR and 98% of general practitioners use EHR in their practice respectively(13,24).

Similarly countries like Russia, India and Pakistan use telemedicine services to provide and connect millions of rural population and patients living in remote areas to qualified health professionals; filling the gap of health care for rural population. Additionally 70% of Cuban population had benefited from the use of digital health tools in primary health care to monitor chronic diseases(13).

Although the same can't be said to developing nation where the implementation and sustainable adoption and practice of digital health technologies is still at its infancy stage(20,25). This can be

seen in most African countries including Ethiopia where the internet penetration is still below 40%. Even though increased mobile adoption, improvement in telecommunication and replacement of manual paper based health information management system with Digital Health Information System (DHIS2) in around 40 African countries(26). Lack of trained health workforce and digital health interventions that are only limited to pilot programs in urban centers, affect the adoption and sustainable implementation of digital health tools(7,13).

In addition to this, implementation and adherence to national strategies and policies remains insufficient with 60% of African countries lacking dedicated digital health policies unlike European member states with 83% having national DH policy or strategy. But some progress is seen in South Africa, Ghana, Kenya and Uganda, where usage of mobile application in Kenya and Ghana for health care had bridge the gap of logistic and financial barriers with around 20 million users in Kenya indicating the impact of strong policy and framework in enhancing health outcome and reducing cost(10,13,27).

Ethiopia has also has shown improvements in digitalization of the health system over the past decade, while infrastructure and digital literacy challenges still persist, the Ministry of Health has been expanding the use of platforms such as DHIS2 which is currently scaled nationwide, electronic medical record (EMR) system in 58 health facilities including 6 hospitals and 16 health centers in AA, and eCHIS implementation for the management of data at community level has shown improvement after manual development and capacity building to experts, also 8011 health posts had implemented it with increase in individual registration to 25 million. Other efforts in digitalization of the health system included the Master Facility Registry and Integrated Human Resource Information System all for interoperable health system and patient centered digital health(28,29).

2.2. Digital Health Literacy

The concept of digital health literacy which has evolved from eHealth literacy has had different perspectives based on different researchers because of its dynamic nature. As Norman and Skinner foundational definition of eHealth literacy which is still relevant, it is an extension of traditional health literacy consisting of six concepts which are traditional literacy, health literacy, computer literacy, information literacy, media literacy and scientific literacy where the combination of this skills adds up to eHealth literacy(30). Building on this a study by Gistad

combined it with social, cultural and situational factors(31). Subsequent researchers also found that eHealth is not only about accessing and understanding information but also includes the ability to use and navigate health information through technology development strategy(32).

After multiple studies on eHealth literacy, a study done by Traver introduced and examined digital health literacy as way of creating patient engagement and clinical decision making including technical skill and digital health information management to identify accuracy and credible online information and sources(33). Similarly transactional model of eHealth literacy that came up in 2018, represent it as competence framework with the components of; functional which is reading and writing about health digitally, communicative; online collaboration and communication, critical; ability to examine the credibility of digital information and translational which is applying digital information(34).

Later on a multi-dimensional analysis that defines digital health literacy as a dynamic concept including goal driven regulation, information processing, communication and utilization emerged. This framework indicates that digital health literacy requires understanding, active and purposeful use of digital resources to improve health care outcomes but also see for factors that shape digital health literacy such as access to digital resource, previous health knowledge and functional literacy(35).

When patients come to their physicians now a days they come with more information from the internet where the physician not only have to give solution but also be involved in the clarification and guidance. Therefore implementation and adoption of digital health requires the engagement, motivation and the competency of all stakeholders including both health providers and the population in general. This involves highly skilled and knowledgeable health workforce that could adapt, ethically utilize, develop and design digitized health service(36).

A higher DHL level enables a health professional to engage with his patients through digital channels to enhance information sharing to patients, communicate remote patients, track the progress of their patients and increase medication adherence by patients to improve health outcomes and reduces cost for health services(37). DHL can be affected by different factors such as age, resource availability, attitude and training. Studies shows that literacy was higher among young professionals where they are said to be digital natives and challenges of adaptation in the older generation(17). Which affects the practice of digital health by physicians that ranges from

using social media platforms to promote and educate health such as health blogs, recommending phone applications, using DH tools provide care to patients(38).

The DHL of health professionals in Ethiopia showed a very steady growth with only 49.85% of the professionals having high level of DHL; indicating the lack of skill to navigate digital health platforms(19). Subsequently studies conducted during the COVID 19 pandemic had an increased DHL level of professionals. This increment might be attributed to the lockdown due to pandemic where services had to be through digital platforms(17).

In addition to this variation in the level of DHL across the different regions of Ethiopia, where Addis Ababa having the highest digital literacy level of 61% which is associated with improved infrastructure, access to digital tools, training programs and also high internet penetration. Regions like Amhara follows with 56% and Oromia had 44%(17). This likely determines the use and the effective adoption of digital health practices.

2.3. Practice of Digital Health

The current digital developed health facilities and the transition to service given at home are requiring both health care providers and patients to have digital health literacy as the care providers need to give digital health consultations and the patients to be able to navigate and operate digital devices to receive services(37).

For wider digital health adoption, hurdles like limited digital skills among clinicians and general public accessibility issues need to be solved. Trained healthcare professional with clear knowledge on digital health benefits reduces skepticism, acting as a key factor to promote digital health practices. A study in Saudi Arabia shows that while internet penetration and usage is high, 90% patients still rely on their physicians. In contrast high proportion (80%) of Austrian population use online health resources more(39).

As American Medical Association (AMA) survey compares how there is an increase on the adoption and increased familiarity and practice of different digital tools among physicians such as the remote monitoring tools which increased from 12% in 2016 to 22% in 2019 and 30% in 2022 similarly, the use of tele-visits rose to 80% in 2022 from 14%. The highest usage was seen on hospitals, physicians under 50 and primary care providers. According to AMA survey, the use of digital health tools by physicians increased from 2.2 in 2016 to 3.8 in 2022(40). This is in line

with Organization for Economic Cooperation and Development (OECD) report where the rate on use of digital health technologies like teleconsultation which was 0.6 per patient per year in OECD countries doubled by 2021(41).

In the interpretation of digital literacy into practice multiple factors plays a part, a study done in Vietnam shows that even though the health professionals had moderate digital health literacy, they struggle to adopt and effectively use digital tools like telemedicine, eHealth book system and even diagnostic AI which are widely accessible in their health system. Limited training to the professionals and low perception on the benefit of digital health were mentioned as key factors for the low practice(42).

Integrating DH tools into the health system has been a breakthrough towards achieving sustainable development goals of equity and access. The increased access to services for ethnic minority women and enhancing social empowerment through health education using short messages in Vietnam and Peru with reduction in maternal mortality as a result of increased access to maternal health services through mHealth and improved adherence to treatment in people living with human immunodeficiency virus in Burkina Faso, to using mHealth to strengthen the community health and equitable care by improving the agency of health extension workers in Ethiopia could be seen as DH bridging the gap to existing inequalities and improving health outcomes(11,43).

Ethiopia had been working on prioritizing a national strategy for digital healthcare, the Digital Health Activity Initiative which had successfully supported 34 health facilities to implement EMR and 25 health posts to be paperless had increased the practice of digital health platforms. Even though the health system is making advances, challenges of limited investments in maintenance, internet connection, infrastructure, shortage of workforce still exist(6,19,44). According to a study conducted at Gonder university hospital; while 69.3% of health professionals at a tertiary hospital reported high eHealth literacy, the actual practices remained low, with only 2.4% of professionals recommending online platforms to their patients. This suggests that high self-reported eHealth literacy might not necessarily translate into practical digital health engagement, especially in patient care and could be affected by other factors like attitude of the professional towards DH, access to tools and lack of information technology staff (5).

2.4. Conceptual Framework

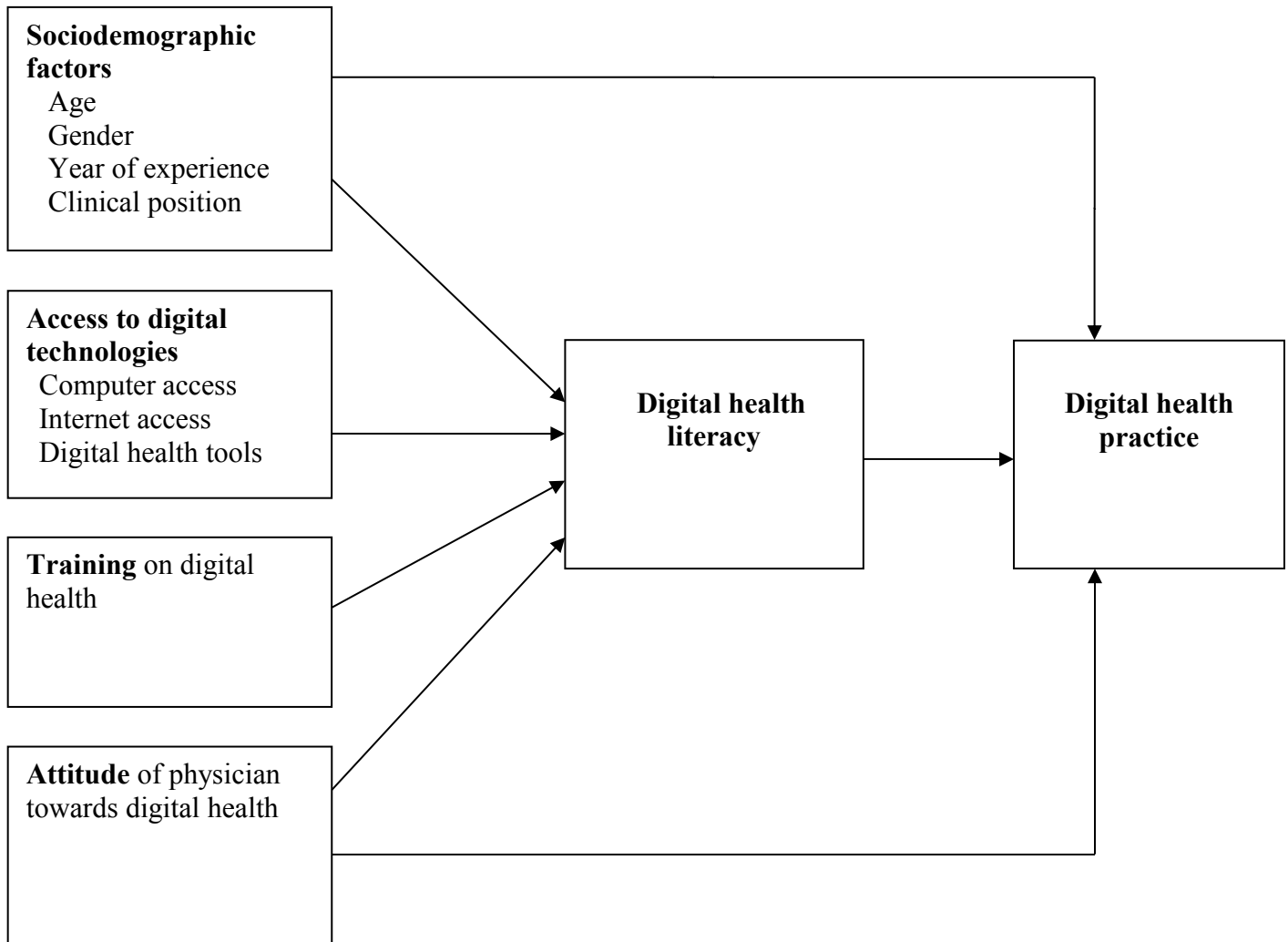


Figure 1. Conceptual Framework outlining key factors influencing digital health literacy and practice based on prior literatures, May, 2025

The conceptual framework for this study as expressed in the above figure is adapted from multiple researches previously done(15,20,38). It shows the relationship of main variables influencing practice of digital health available and accessible for the physicians.

Digital health literacy is a foundation for the framework as it directly affects the outcome and mediated the effect of multiple variables such as access to technologies and training, which serve as enablers for developing digital health literacy in turn influencing the effective engagement in practice, as even though physicians have high digital literacy their practice depends on whether they have access to computer, internet and other digital tools. Similarly training on digital health also enhance the digital literacy level of the professionals improving the ability to practice digital health (19,38).

Sociodemographic variables including age, year of experience and role or position can influence the strength of the relationship as younger physicians and physicians with more experience may have better literacy and access than older and less experienced physicians which affects the utilization in clinical practice(46).

Attitude of physicians towards digital health is assumed as factor that has effect on both literacy and practice. Favorable attitude of physician can enhance literacy but also influence physicians to adopt and integrate it to their practice(45).

3. Objectives

3.1. General Objective

- To assess the digital health literacy and practice among physicians in government teaching hospitals in Addis Ababa, Ethiopia 2025.

3.2. Specific Objective

- To assess the digital health literacy level of physicians in selected government teaching hospitals in Addis Ababa, Ethiopia.
- To assess the practical use of digital health among physicians in clinical practice at selected government teaching hospitals in Addis Ababa, Ethiopia.
- To examine the association of digital health literacy and other associated factors with digital health practice of physicians in selected government teaching hospitals Addis Ababa, Ethiopia.

4. Methods

4.1. Study Setting

The study was conducted in Addis Ababa, capital city of Ethiopia with estimated population of 5,704,000 million as of 2024(47). Addis Ababa is the largest city in Ethiopia that had become the epicenter for the digital growth of the country. It is also home to the largest referral hospitals in Ethiopia providing service to patients referred from all over the country facilitated by highly skilled and experienced medical professionals and equipped with modern medical equipment and technologies.

The 11 sub-cities of Addis Ababa, under the Addis Ababa Health Bureau have a total of 43 hospitals out of which 13 are governmental hospitals and there are 30 private for profit hospitals(28). The teaching government hospitals in AA include, Tikur Anbesa Specialized Hospital, St Paul Hospital, Yekatit 12 Hospital Medical College and Menelik II Comprehensive Specialized Hospital.

4.2. Study Design

A facility based quantitative cross-sectional study was conducted through self administered questionnaire.

4.3. Source Population

All physicians working at the selected government teaching hospitals in Addis Ababa were the source population.

4.4. Study Population

The study population included selected physicians working at the selected government teaching hospitals in Addis Ababa during the study period.

Inclusion criteria

Physicians working at selected hospitals at the time of data collection, physicians who were willing to participate and provide informed consent.

Exclusion criteria

Physicians who had worked less than 6 month and physicians on leave during the data collection.

4.5. Sample Size Determination

A single population proportion formula, $[n = (Z \alpha/2)^2 p (1-p) / d^2]$, was used to estimate the sample size for the study. A prevalence of 53.8% was taken from a study on digital health literacy(18). Level of significance to be 5% ($\alpha = 0.05$), $Z \alpha/2 = 1.96$ and absolute precision or margin of error to be 5% ($d = 0.05$).

Computing with the above formula gives $(1.96)^2 0.538 \times 0.462 / (0.05)^2 = 381.9$. 10% non response rate (38.19) was added to compensate for possible non respondents. Based on these assumptions, total calculated sample size was 420.

Since the $n > 5\%$ of the population which is 6426 physician in Addis Ababa(29).

n should be multiplied by correction factor $n_c = nN/N+(n-1)$

Calculated sample size (n) = 420

Total population (N) = 6426

Corrected sample size (n_c)

$$\begin{aligned} n_c &= 420 \times 6426 / (6426 + (420 - 1)) \\ &= 394.3 \end{aligned}$$

❖ Corrected sample size was **394**

4.6. Study Variables

Dependent Variable

Digital health practice

Independent Variables

Sociodemographic factors including Age, gender, clinical position, clinical experience, digital health literacy, access to digital technologies; access to computer, internet, digital health tools and technologies, training on digital health and attitude of physicians towards digital health.

4.7. Sampling Technique and Procedures

A stratified sampling was used to ensure different subgroups of physicians were represented in the study. The strata included general practitioners, residents and specialists who were working at the selected government teaching hospitals. After stratifying according to their respective profession, the total sample size was proportionally allocated based on the number of physicians in each teaching government hospitals and lastly the respondents were selected through systematic random sampling from each of the subgroups to capture variation across the physicians. The calculated k value for each hospital included Tikur Anbesa Specialized Hospital (k= 6), Menelik II Comprehensive Specialized Hospital (k= 7), St Paul Hospital (k=6) and Yekatit 12 Hospital Medical College (k=7).

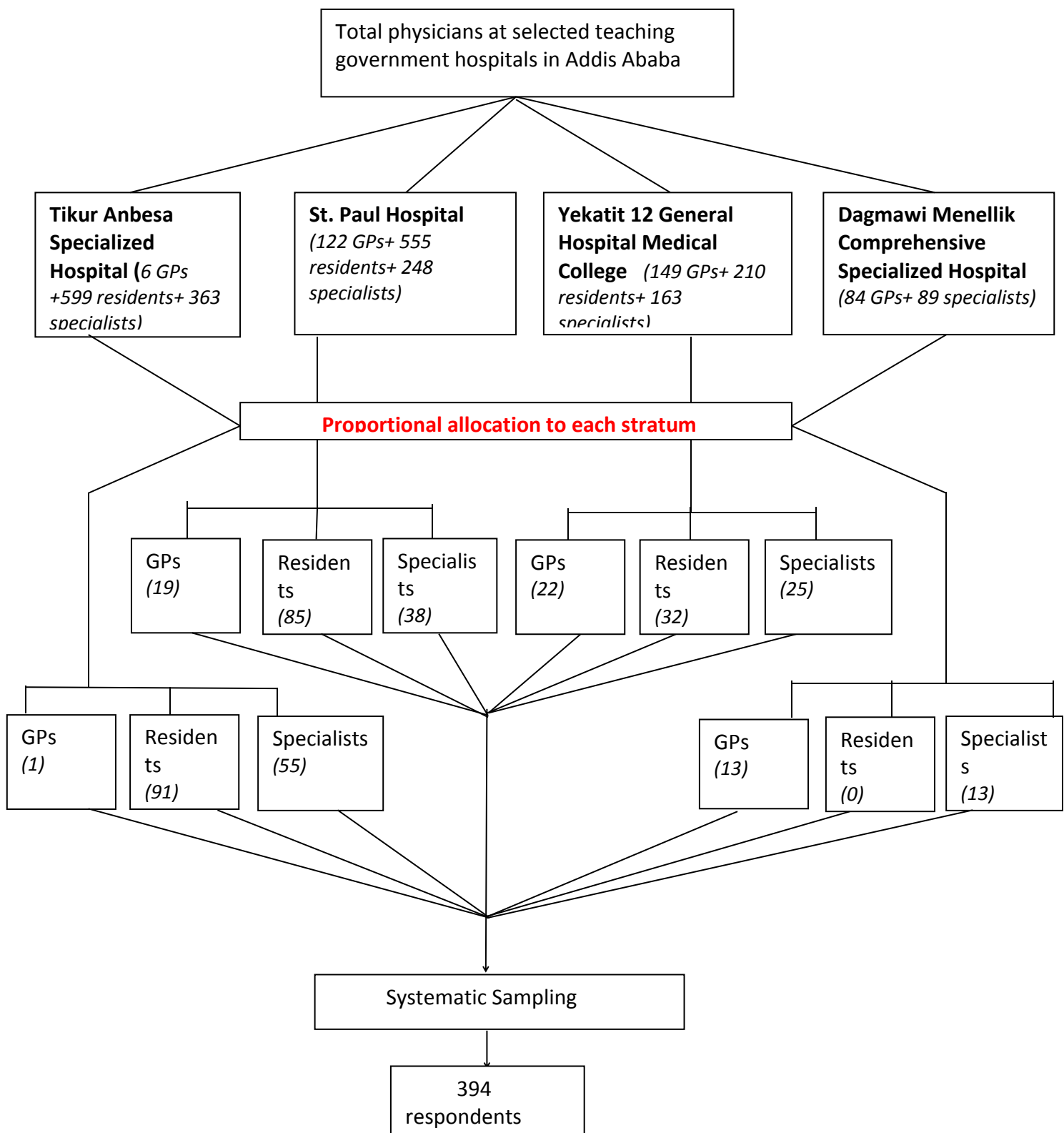


Figure 2. Diagrammatic presentation of the sampling procedure in selected teaching government hospitals in AA, May 2025

4.8. Data Collection Tools

Structured questionnaire was used to gather quantitative data from physicians at selected government teaching hospitals. It was pretested for consistency and clarity before the actual data collection at All Africa Leprosy, Rehabilitation and Training Center (ALERT) Hospital. The questionnaire was administered to collect measurable data that can be analyzed statistically to assess the relationship between variables. It was self-administered prepared in English, distributed through a link and three data collectors with health background were trained to inform participants on the purpose of the study and to ensure response rate.

The questionnaire had five main parts consisting of sociodemographic components, access to digital technologies which included eight questions to assess access to computer, internet, digital health tools and resources in workplace. The digital health literacy section included a total of 14 Likert questions adapted from the digital health literacy instrument and previous published researches(45,48) classified into four domains, where information search had four questions, adding self generated content and evaluating reliability with three questions each, and determining relevance had four(18).

The fourth part of the questionnaire had 16 Likert questions to assess attitude towards digital health among participants adapted from The digital Health Scale and other prior published studies(45,49). The last section which was digital health practice similarly had total of fifteen questions to assess digital health usage in clinical activities with 14 Likert scale questions adapted from related articles and studies, where the three domains; communication and information, monitoring and coordination of patient care each consisting of five question and four for supporting provision of health service and a multiple option question to capture currently used digital tool or platform by participants(7,38,42,50,51). This was reviewed for relevance, context appropriateness and pretested to ensure clarity.

4.9. Operational Definitions

Digital health literacy: is the ability to find, understand and analyze digital health information for health purpose(10). It was measured on information search, adding digital content, evaluating reliability and determining online information relevance, using a 14 item Likert scale questions with response option ranging from very easy to very difficult. Participants who scored below median were classified as low literacy and above or equal to the median as high digital health literacy(18,48).

Attitude towards digital health: is the opinion and personal intention towards digital health. Measured with 16 questions using five point Likert scale ranging from strongly agrees to strongly disagree. The item scores were summed and averaged to create a final composite variable range of one to five. Scores above three (Agree, Strongly Agree) categorized as “Favorable Attitude”, while scores of three or below (Neutral, Disagree, Strongly Disagree) categorized as “Unfavorable Attitude”(45).

Digital health practice: in this study it is defined as the use of digital means for communication and information, monitoring and coordination of patient care and supporting provision of health services(51). It was measured using a 14 item Likert scale question on the usage frequency of digital means rated on four point (always, often, sometimes, never) and a question regarding the type of tool used(38). Physicians with score above or equal to the median were classified as having high practice and those below the median as low.

Access to digital technology: in this study it is defined as the availability and usability of digital technologies that physicians can use in their clinical practice.

4.10. Data Quality Assurance

The questionnaire was pre-tested among physicians taking 5% of the sample size in order to ensure clarity, reliability and uniformity on understanding of the questionnaire before the actual data collection. Cronbach alpha score was done to assess the internal consistency of the questionnaire and it was 0.84, 0.77 and 0.81 for DHL, attitude and practice respectively. Training was provided for three data collectors and data collection was evaluated throughout the data collection process and checking for error in filled questionnaires.

4.11. Data Processing and Analysis

Data from Kobo Toolbox was cleaned in excel, and then exported for analysis to SPSS version 26.0. Descriptive statistics was done for all variables in the study using statistical measurements; frequency tables, graphs, percentages, median and interquartile ranges. Binary logistic regression analysis was used to ascertain the association between the predictor and the outcome variables ensuring sufficient sample size, binary outcome and no multicollinearity among independent variables with variance inflation factor (VIF) values of all < 2 (ranging from 1.05 to 1.8) and tolerance value ranging from 0.6 to 0.9. Variables having P value less than 0.25 were candidates for multivariable analysis. Multivariate logistic regression analysis was used and variables with a P -value less than 0.05 were identified on the basis of the adjusted odds ratio (AOR) with 95% confidence interval (CI) and considered as having significant association. Lastly model fit was examined using Hosmer and Lemeshow goodness of fit test.

4.12. Ethical consideration

Ethical clearance was obtained from the Research Ethics Committee of the School of Public Health at Addis Ababa University, Addis Ababa Public Health, Research and Emergency Management, Tikur Anbesa Specialized Hospital, St Paul Hospital, Yekatit 12 Hospital Medical College and Menelik II Comprehensive Specialized Hospital. Oral informed consent was obtained prior to administering the questionnaire, to ensure physicians' willingness to participate. A clear explanation on the purpose of the study, significance, participants' rights, benefits, and risks was provided beforehand. Participants were informed that they have the right to withdraw from the interview at any time, confidentiality will be ensured, and all information collected will remain anonymous and solely used for research purposes.

4.13. Dissemination of Findings

The final report will be submitted and presented to the department of health system management and School of Public Health at Addis Ababa University. Findings of the research will be shared with the respective government hospitals, Ministry of Education and Ministry of Health of Ethiopia. Effort will also be made to publish the major findings of the study in a peer reviewed journals.

5. Result

5.1. Sociodemographic characteristics of respondents

Three hundred sixty six (366) physicians participated in this study completing the questionnaire and were included for the final analysis of the study making the overall response rate 92.9%.

As shown in table 1, among the study participants 218(59.6%) of respondents were males, where more than half of the participants 202(55.2%) being in the age group of 30-39. Most participants were residents 201(54.9%) with majority of physicians having clinical experience of 1-5 years at 235(64.2%) followed by 6-10 years with 108(29.5%).

Table 1. Sociodemographic characteristics of participating physicians (n=366) at selected government teaching hospitals in AA, May 2025

		n = 366	
Characteristics		Frequency	Percent %
Gender	Female	148	40.4
	Male	218	59.6
Age	20-29	141	38.5
	30-39	202	55.2
	40-49	23	6.3
Years of clinical experience	< 1years	11	3
	1-5 years	235	64.2
	6-10 years	108	29.5
	>10 years	12	3.3
Clinical position	General practitioner	53	14.5
	Resident	201	54.9
	Specialist	112	30.6

5.2. Access to Digital Technology

According to this study access to digital infrastructure among the participating physicians was generally high. Majority of them 342(93.4%) had access to Smartphone, 289(79%) desktop, 258(70.5%) to laptop and 233(63.7%) to digital medical devices such as smart watch and electronic record. 359(98.1%) reported access to a computer at their workplace, while 357(97.5%) indicated having internet access. Of these, workplace connectivity was the most common internet source covering 297(81.1%) followed by mobile data 262(71.6%) and private Wi-Fi 142(38.8%).

Access to digital tools within the work environment was reported by 328(89.6%) of respondents most accessible tools included electronic medical record, monitoring tools like glucose monitor and pulse oximetry. But only 71(19.4%) stating that these tools were always functional, majority 225(61.5%) reported that digital tools mostly worked but with occasional issues. Regardless of access only 77(21%) of the physicians had received training on digital health technologies (Table 2).

Table 2. Frequency and percentage distribution of access to digital technologies among participating physicians (n=366) at teaching government hospital, AA, May 2025

Variables		Frequency	Percent (%)
Which digital device do you have access to?	Desktop	289	79%
	Laptop	258	70.5%
	Smartphone	342	93.4%
	Digital medical devices	233	63.7%
Do you have access to computer in your working unit?	Yes	359	98.1
	No	7	1.9
Do you have access to internet?	Yes	357	97.5
	No	9	2.5

Where do you get access to internet?	Mobile data	262	71.6
	Private Wi-Fi	142	38.8
	Workplace	297	81.1
	Internet café	7	1.9
Do you have access to digital tools in work place	Yes	328	89.6
	No	27	7.4
	I do not know	11	3
Are the digital tools you have access to in a good working condition?	Yes, always	71	19.4
	Mostly, with occasional issues	225	61.5
	Rarely in good condition	30	8.2
	No, often non-functional	2	0.5
Have you ever received training on digital health technology?	Yes	77	21
	No	289	79

5.3. Digital Health Literacy Level of Physicians

According to this study 213(58.2%) of the physicians had high digital health literacy. Using the median score of those above the median value of 39 (IQR 36-43) as physicians with high DHL. In regards to the four domains of DHL, physicians had higher literacy on information search 233(63.7%), evaluating reliability 232(63.4%) while determining relevance was 213(58.2%). adding self generated content had lower literacy with only 201(54.9%) categorized as having high literacy (Table 3).

Table 3. Frequency and percentage distribution of digital health literacy for subscales among physicians (n=366) in selected government teaching hospitals in AA, May 2025

Digital health literacy domains	Low		High		Median(IQR)
	Frequency	%	Frequency	%	
Information search	133	36.3	233	63.7	12 (11-14)
Adding content	165	45.1	201	54.9	9(7-9)
Evaluating reliability	134	36.6	232	63.4	8(7-9)
Determining relevance	153	41.8	213	58.2	11(9-12)

5.4. Attitude towards Digital Health

Among the participants 327(89.3%) of the respondents had favorable attitude towards digital health (figure 3). Majority 194(53%) agreed that booking appointments through computer or smart phone is more convenient, and approximately half 180(49.2%) agreed and 115(31.4%) strongly agreed that usage of technology has improved healthcare service quality. Moreover, 180(49.2%) reported that health technologies are easy to use, and 189(51.6%) expressed that they really understand how to use them. But only 77(21%) agreed that video or telephone appointments are as effective as face-to-face visits, while 118(32.2%) disagreed.

Physicians interest with digital tools also was shown as 197(53.8%) expressed interest to see more use of technology in healthcare, while 211(57.7%) were excited about new developments and enjoyed using digital health technologies. However, only 202(55.2%) use such technologies often in practice and just 123(33.6%) having confidence in the confidentiality on digitized medical records. As also 180 (49.2%) expressed that digital health technologies help in reducing human error, and 135(36.9%) agreed that health technologies is good and benefits everyone. On the contrary, only 93(25.4%) disagreed with the idea that these tools might breakdown and affect their work.

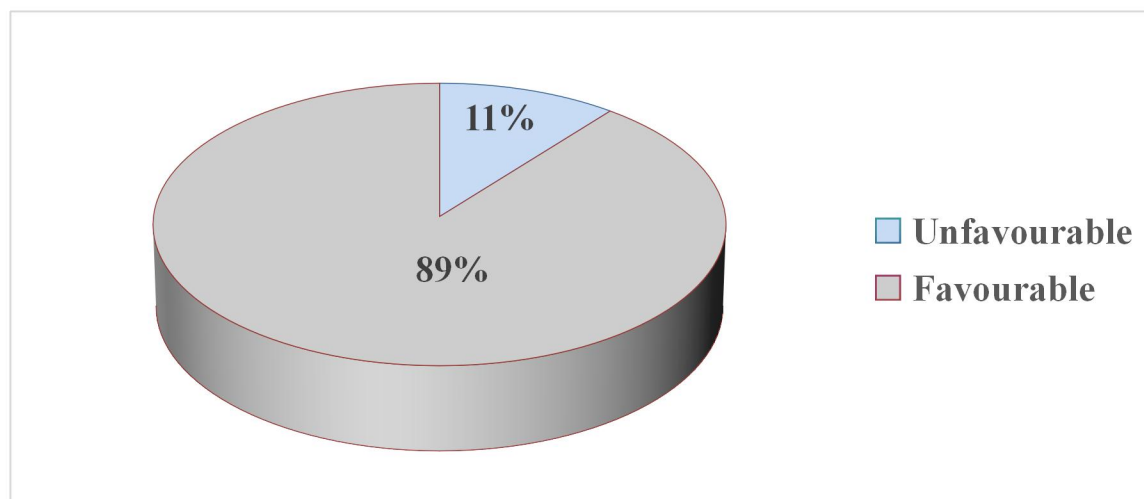


Figure 3. Percentage distribution on attitude towards digital health technology in AA, May 2025

5.5. Digital Health Practice

In this study a total of 184(50.3%) physicians had high digital health practice with 182(49.7%) of them having lower practice using the median of 32 (IQR 27-36). Through the breakdown of the domains (figure 4), the usage frequency of digital means for communication and information was better with 211(57.7%) physicians having a higher score with median of 13 (IQR 11-15), where nearly half 171(46.7%) of physicians often using electronic health record to review patient record and 158(43.2%) using it always. However, engagement on decision supporting assistance tools or software in diagnosis was lower, with only 100(27.3%) reporting often use. 145(39.6%) often communicated with other healthcare professionals through digital platforms, applying digital tools for patient education remained low; 152(41.5%) had never used them, and only 18.3% did so often.

Monitoring and coordination domain had the lowest performance. Even though 151(41.3%) often monitored patient medications digitally and 149(40.7%) tracked patient progress using digital records, usage on tools like mobile apps and remote monitoring devices were rare. In which 257(70.2%) had never used mobile apps or online portals to track patient's adherence to treatment or as reminder and 267(73%) never remotely monitored using wearable devices.

Lastly for the supporting provision of health services through digital health, 148(40.4%) reported regularly accessing relevant digital resources to stay updated, and 128(35%) sometimes used digital platforms for research purposes. Regardless, virtual meeting or telemedicine with patients remained limited as 244(66.7%) had never participated in any sessions, and mobile or web based workflow management was practiced often by only 52(14.2%) physicians.

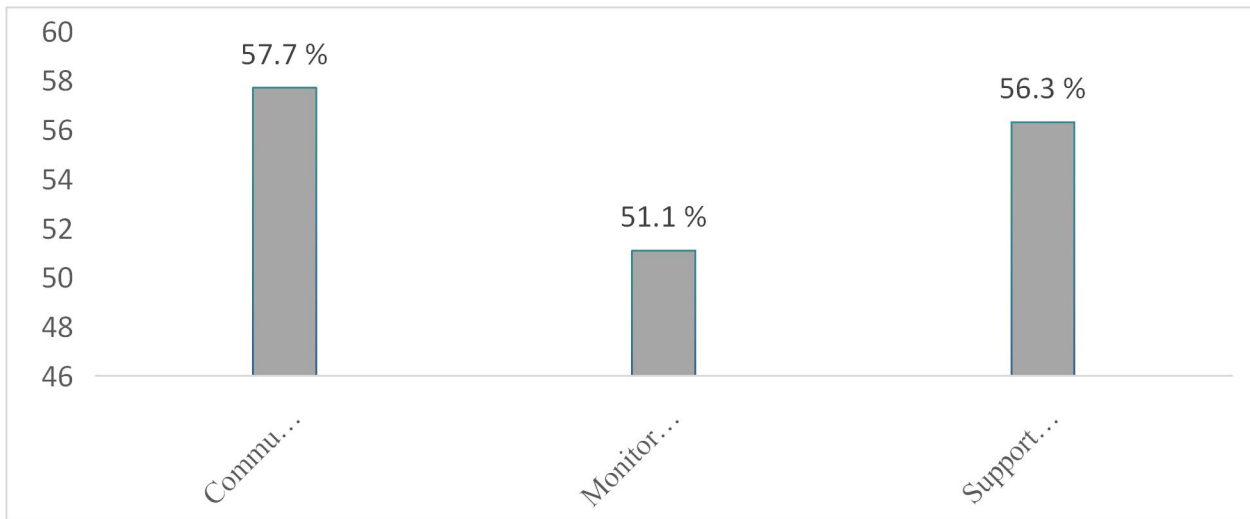


Figure 4. Digital health practice of physicians by domains in selected teaching government hospitals in AA, May 2025

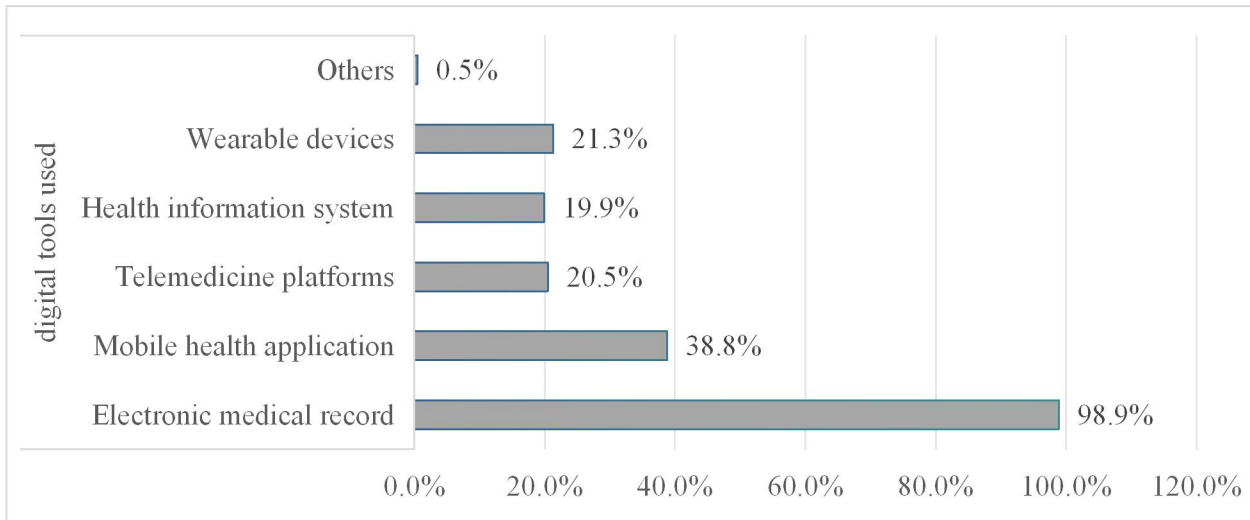


Figure 5. Self reported use of digital health tools and technologies by participating physicians in selected teaching government hospitals in AA, May 2025

5.6. Factors Associated with Digital Health Practice of Physicians

Binary and multivariable logistic regression analyses were performed to assess factors that are associated with digital health practice of physicians. All the independent variables were included in binary analysis and factors with P value less than 0.25 such as age, professional status, experience, access to digital tools at work, training, attitude and digital health literacy were included in multivariable logistic regression analysis (Table 4). Lastly Model fit was examined using Hosmer and Lemeshow goodness of fit test with P value of 0.67, indicating a good model fit to the data.

As shown in the table below findings from the multivariable logistic regression analysis showed that physicians with high digital health literacy are 2.05 times more likely to have high practice as compared to those with low literacy (AOR=2.05, 95% CI: 1.27-3.3, $P=0.003$). Physicians with no access to digital tools at workplace were 82% less likely to practice digital health (AOR= 0.18, 95% CI: 0.06-0.5, $P=0.001$).

Moreover, trained physicians on digital health tools and technologies were found to be 2.05 times more likely to have high practice than those without any (AOR=2.05, 95% CI: 1.16-3.6, $P=0.01$). Although sociodemographic variables like age, gender, experience didn't have significant association, among the physicians that participated in this study, general practitioners had higher odds of reporting higher digital health practice than specialists (AOR= 0.26, 95% CI: 0.1-0.6, $P=0.005$).

Table 4. Multivariable logistic regression of selected variables in association with digital health practice of physicians in selected government teaching hospitals in AA, May 2025

Variables		Digital health practice			
		High (%)	Low (%)	COR(95% CI)	AOR(95% CI)
Age	20-29	75(20.5)	66(18)	1	1
	30-39	102(27.9)	100(27.3)	0.89(0.58-1.38)	1(0.56-1.78)
	>=40	7(1.9)	16(4.4)	0.38(0.15-0.99)	0.9(0.26-3.03)
Clinical position	GP	36(9.8)	17(4.6)	1	1
	Resident	100(27.3)	101(27.6)	0.47(0.25-0.89)	0.54(0.25-1.15)
	Specialist	48(13.1)	64(17.5)	0.35(0.18-0.7)	0.26(0.1-0.67)*
Years of clinical experience	<1 years	8(2.2)	3(0.8)	1	1
	1-5 years	118(32.2)	117(32)	0.38(0.98-1.46)	0.6(0.1-3)
	6-10 years	55(15)	53(14.5)	0.39(0.98-1.54)	0.8(0.14-4.5)
	>10 years	3(0.8)	9(2.5)	0.125(0.02-0.8)	0.32(0.03-2.9)
Access to digital tools in work place	Yes	179(49)	149(40.7)	1	1
	No	5(1.4)	22(6)	0.19(0.07-0.5)	0.18(0.06-0.5)*
Received Training	Yes	53(14.5)	24(6.6)	2.66(1.6-4.5)	2.05(1.2-3.6)*
	No	131(35.8)	158(43.2)	1	1
Attitude	Favorable	172(47)	155(42.3)	2.49(1.2-5)	1.16(0.5-2.6)
	Unfavorable	12(3.3)	27(7.4)	1	1
Digital health literacy	High	123(33.6)	90(24.6)	2.06(1.35-3.1)	2.05(1.3-3.3)*
	Low	61(16.7)	92(25.1)	1	1
*Significant at P value < 0.05, First = reference					

6. Discussion

This study investigated the level of digital health practice, DHL and their association. According to the findings of this study half of physicians had high digital health practice in the domains of communication and information, monitoring and coordination of patient care and supporting provision of health services. As compared to previous studies in different regions of Ethiopia where limited readiness and usage of digital system were reported due to infrastructure limitations, technical capacity this current finding is relatively good. This could be explained by the fact that this study was conducted in urban teaching hospitals where digital systems like the EMR had been systematically implemented, exposure to digital tools, institutional support, and access to internet connectivity is more available(29).

Moreover, self reported use of digital health technologies by participating physicians included 98% for EMR, 38.8% reported using mobile health applications, wearable or remote monitoring tools (21%), and 20.5% used telemedicine platforms. While the utilization of EMR was high, possibly reflecting the effort of Ethiopian Ministry of Health and nongovernmental institution effort to adapt EMR systems for all hospitals and initiatives to strengthen the national electronic health system(12).

As compared to digital health usage patterns in other studies, the reported use of other interactive and advanced technologies such as mobile health application use was lower than in Ghana(52.8%) and in Saudi Arabia(86.3%). similarly, telemedicine use was lower than previous studies in Tikur Anbesa(40.6%), Southern Ethiopia(26%) and Saudi Arabia (62.8%), lower rate in telemedicine utilization might be due to variation between study participants on sample size and study area and national digital maturity(20,52,53). Also these lower adoption levels may also reflect current digital health landscape in Ethiopia, where implementation is still in its early stages and priorities are still primarily focused on foundational systems like EMR. More advanced tools may face additional regulatory, technical, and training-related challenges, limiting their wider adoption.

However only 49% of those who reported EMR use demonstrated high digital health practices overall. Highlighted by previous studies from Vietnam, Ghana and Nigeria that showed similar gaps where despite the access, availability and awareness of tools consistent and effective actual usage remained limited unless supported by adequate literacy, training, and workflow integration,

and as compared to developed countries like the United States of America where over 80% of health professionals regularly use digital tools in structured workflows, the practice level observed in this study remains lower(40,42,54). This outcome could be due to differences in policy enforcement, financial investment and digital literacy levels.

The digital health literacy level of physicians was 58.2 in this study, consistent with study on teaching hospital in Amhara (58.7%), but slightly above the national pooled estimate of 56% during the COVID-19 pandemic(17). But also exceeds the 53.8% among physicians in Addis Ababa and the 51.8% found in Northwest Ethiopia(18,45). These improved literacy reflect a better resource availability, and exposure to digital tools across facilities throughout the years but still lower than the literacy level in Iran(55) and other developed countries(54).

The digital health literacy of physicians was a predictor of higher digital practice. Those with higher DHL were nearly twice as likely to engage in high level digital health use. Similarly a study found that healthcare workers with higher DHL scores demonstrated greater confidence in adopting digital health technologies and reduced perceived complexity, making digital health tools more accessible to providers(46). The strong association between DHL and practice help in understanding that the adoption of digital health tools are not simply because of availability; but also competencies in searching, evaluating, determining relevance and applying digital information where literacy builds confidence. This reinforces the need for institutional investment in structured digital literacy programs, integrated into both pre-service training and in-service professional development(19,47).

The study also pointed out that training as a main factor for better utilization status among physicians, where those that had received training were 2.05 times more likely to use digital tools in their practice. This is supported by studies from Ethiopia, Zimbabwe, Vietnam which found that digital training improved both uptake and user satisfaction of clinical decision support tools and digital records(3,8,41,56). Another systematic review on barriers and facilitators of digital health technology use emphasized lack of training could result in low self efficacy in the utilization of digital health technologies, more than that training not only improves knowledge but helps overcome resistance among older or less technologically experienced professionals(36). In Ethiopia, however, structured and standardized digital health training is still limited to pilot projects or system launches, indicating a key policy gap and physicians that received training in

this study were only 21% which is very low when compared to European member states where 71% of them providing in-service training to their health professionals mainly medical professionals and 60% of them providing digital health education for health science students at higher educational institutions(10).

Additionally, Physicians without access to digital tools were 82% less likely to practice digital health. These findings align with studies where infrastructure limitations were the leading barrier to digital engagement among healthcare providers(57). While there have been substantial progresses in digital infrastructure especially in Addis Ababa with increased internet coverage, recent 5G deployment and implementation of digital tools at facilities. Shared devices, limited terminals, restricted Wi-Fi, or unstable connections may still affect regular use by physicians(11).

Another significant factors reported by this study was general practitioners were more likely to report high digital health practice compared to specialists. This is in line with studies from UK and Finland where younger generation professionals had better digital competency than older(56). In contrasts, findings from the United States of America, shows specialist's access more advanced diagnostics and digital imaging tools into their practice routines(40). In this study setting the contrast could be due to GPs and residents being more involved in routine patient flow tasks, such as entering outpatient data, reviewing electronic lab results or other frequent digital interaction.

7. Strengths and Limitations

Strengths

This study is among the very few to asses both digital health literacy and practice among physicians in urban setting teaching hospitals using a domain based measurement approach. Stratified sampling across physician (GPs, residents, and specialists) among the selected hospitals strengthened the representativeness, and the sample size of the study strengthens the statistical power for multivariable analysis.

Limitations

The limitation of the study includes, study setting of it being conducted in a limited number of government teaching hospitals which are centers for innovation, might not reflect the experiences of physicians in rural areas or private institutions. The other is data collection through self reported data introduces the possibility of social desirability and the measurement of specific digital tools such as EMR or telemedicine usage did not differentiate between frequency or depth of use, potentially overestimating effective engagement. Lastly, the study design being cross-sectional limits causal relation between the predictors and digital health practice.

8. Conclusion

In order to successfully implement and sustain digital health tools and technologies in health care delivery, it is better to know where the care providers stand in regard to their competency, attitude and practice and plan the next steps accordingly. The findings from this study revealed that less than half of physicians exhibited high digital health practice, despite widespread access to tools like EMRs in the facilities. Digital health literacy, training and access to digital tools were all strongly associated with better digital engagement in clinical practice.

The role of user competence was seen by the significant link between literacy and practice emphasizing on the need to go beyond infrastructure and address human capacity. It was also suggested that front-line clinicians, such as general practitioners and residents were more likely to interact with digital systems regularly than specialists, possibly due to daily task related demands rather than tool availability pointing to strategic changes and competency based approach to digital health implementation that empowers healthcare professionals at all levels. All those insights highlight both progress and persistent gaps in the integration of digital health into clinical workflows in Addis Ababa hospitals.

9. Recommendations

Health facilities should ensure reliable access to digital tools and internet connectivity with investment in strengthening digital infrastructure and providing technical support at all points of care, in order to increase successful implementation of different digital health projects and initiatives. They should also establish a mechanism to monitor and evaluate the effectiveness of implemented digital health systems and technologies. In addition, institutionalize regular in-service training programs on current and new emerging digital health systems such as EMRs, telemedicine platforms, mobile health applications and AI to improve the practice of digital health technologies by care providers. Moreover, they should work together with government to encourage and enforce clear standards and specific policies that aligns with national digital health strategies.

Government should initiate, encourage and allocate funds in digital health learning platforms, innovation hubs, experience exchange programs and development of local digital health tools and technologies. Strengthen the collaboration of government and private sectors including academic institutions, private digital technology firms and health facilities to enhance quality and access to various digital health innovations and platforms while involving health care professional and end users in digital health technology developments and implementations.

Ministry of Health with Ministry of Education should integrate digital health into curriculum to both undergraduate medical and health science education; prepare modules and continuing professional development for health professionals to create well prepared professionals.

For future researches, further research should be conducted on multi-centers to capture digital health adoption patterns across different hospitals, including rural and private settings to improve generalizability.

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11. Annexes

ADDIS ABABA UNIVERSITY

College of Health Science; School of Public Health

Annex 1: Participant Information Sheet

Greetings, my name is----- . I came from Addis Ababa University, College of health science department of health system management and policy. I am here to take data from physicians for my master's thesis entitled as "Digital health literacy and practice among physicians in Addis Ababa's government teaching hospitals: A cross-sectional study."

Purpose of the study - is to assess the digital health literacy level of physicians and its association with the practice of digital health in selected government teaching hospitals in Addis Ababa. The findings of this study will help to improve the digitalization of the healthcare services and used as an input to enhance physicians experience with digital health.

Procedures - The selection of study participants will be random thus you were selected to participate in this study by chance. A data collector will inform you about objective of the study and if you agree to participate, you will be required to complete a self administered questionnaire on access to digital tools, digital health literacy, practice and your attitude towards digital health tools. The time that you need is about 20-25 minutes to complete the questionnaire.

Benefits - you will not receive any special benefit by participating in this study.

Risk- your participation in this study will not harm you in any way.

Rights of participants - Participation is fully voluntary. You do not have to answer any question if you do not want to take part or you have the right to stop filling this questionnaire at any time and I will respect the decisions you make but the information that you provide will greatly help to achieve the objective of this study.

Confidentiality- I would like to assure you that, the information that you provide is strictly confidential and will only be used for the research purpose. Your responses will be anonymous as name will not be written on the questionnaire.

For further inquiries or concerns, you can contact the principal investigator of the study on mobile number 0912333810 or send your suggestions by email to: semarefine@gmail.com.

Annex 2: Informed Consent Form

I have read and understood the purpose, risk, benefits of the study and also understood the choice to voluntarily participate and withdraw from the study at any time.

Considering the information you got from the above into account, are you willing to participate in this study?

1. Yes

2. No

Thank you for participating in this study.

Sign_____

Date_____

ADDIS ABABA UNIVERSITY
College of Health Science; School of Public Health

Annex 3: Self Administered Structured Questionnaire for Physicians

Questionnaire ID No-----

Name of hospital-----

Date of interview-----

Part 1. Sociodemographic Characteristics

Instruction: please choose and circle the number that fits your status out of the choices provided in the list.

NO	Questions	Categories	Skip
101	Age	1. 20-29 years 2. 30-39 years 3. 40-49 years 4. >= 50 years	
102	Gender	1. Female 2. Male	
103	Years of clinical experience	1. < 1 years 2. 1-5 years 3. 6-10 years 4. >10 years	
104	Clinical position	1. General practitioner 2. Resident 3. Specialist	

Part 2. Access to Digital Technologies

Instruction: please choose the choice that exactly fits your current status out of the list.

NO	Questions	Categories	Skip
201	What digital device do you have access to? (choose all that applies)	1. Desktop 2. Laptop 3. Smartphone 4. Digital medical devices (smart watch, electronic chart)	
202	Do you have access to computer in your working unit	1. Yes 2. No	
203	Do you have access to internet	1. Yes 2. No	If yes proceed to 204. If no skip to 205
204	Where do you get access to internet?	1. mobile data 2. Private Wi-Fi 3. Workplace 4. Internet cafe	
205	Do you have access to digital tools in your workplace? (Eg:- electronic health records, telemedicine platforms, wearable devices, chatbots etc)	1. Yes 2. No 3. I do not know	If yes proceed to 206. If not skip to 208
206	If yes for question number 205, which digital tool do you have access to?	_____	
207	Are the digital tools you have access to in a good working condition?	1. Yes, always 2. Mostly, with occasional issues 3. Rarely in good condition 4. No, often non-functional 5. I do not know	
208	Have you ever received training on digital health technology	1. Yes 2. No	

Part 3. Assessment of Digital Health Literacy

Instruction: For each question below, carefully choose the response that best represents your answer. The questionnaire uses a scale ranging from "very difficult" to "very easy" to assess your experiences and abilities related to digital health literacy. Choose by ticking (✓) the option that most accurately reflects your level of difficulty or ease in searching online for health information, dealing with digital resources as described in the tasks below. Answer all questions based on your current knowledge and experience.

No	Characteristics	Category			
		Very easy (4)	Easy (3)	Difficult (2)	Very difficult (1)
	Information search				
301	Finding helpful health resource on the internet.				
302	Making choice from all the information you find online.				
303	Use the proper words/search query to find helpful information you are looking for digitally.				
304	Find the exact information you are looking for online.				
	Adding self-generated content				
305	Formulate a question online				
306	Express opinions, thoughts, or feelings in writing				
307	Write your message so it can be understood as you intend				
	Evaluating reliability				
308	Decide whether the digital information is reliable or not				
309	Decide whether the digital information is written with commercial interests				

310	Check multiple websites to see whether they provide the same information				
	Determining relevance				
311	Decide whether the digital information is applicable				
312	Applying the digital information in daily life				
313	Use the digital information to make health related decisions				
314	Managing healthcare information for scalability (to support expansion of healthcare services or growing patient number)				

Part 4. Attitude towards Digital Health

Instruction: please complete the following questions about your attitude towards digital health by ticking (✓) the response that expresses your level of agreement from the listed options.

Please note that there is no right or wrong answer.

No	Characteristics	Choice for level of agreement				
		Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree(1)
401	Making an appointment on a computer or Smartphone is more convenient for me.					
402	I think using technology has improved healthcare.					
403	I really understand how to use health technology.					
404	Video and telephone appointments with my patients are as good as meeting in person					
405	Health technologies are easy to use					
406	Patients and hospitals rely too much on technology					
407	Technology could never replace real health					

	professionals					
408	I would like to see more use of technology in healthcare					
409	Health technology is less likely to break down, and my work will not be affected					
410	Health technology reduces human error					
411	The thought of using an online appointment system makes me relaxed					
412	The thought of new developments in health technology is exciting					
413	I often use health technology					
414	Health technology is good for everyone					
415	I'm confident that technology will keep the medical records private					
416	I enjoy using health technology					

Part 5. Digital Health Practice

Instruction: For each question below, carefully choose and circle the response that best represents your answer. Answer all questions based on your current experience.

No	Characteristics	Category			
	Communication and information	Never(1)	Sometimes(2)	Often(3)	Always(4)
501	I use electronic health records to review patient records or medical histories.				
502	I access laboratory results or diagnostic imaging digitally to make clinical decisions.				
503	I use decision supporting tools or software as assistance in diagnostic.				
504	I communicate with other healthcare professionals; pharmacists, laboratory technicians and nurses through digital platforms for patient related discussions.				

505	I use digital health tools to teach patients about their health conditions or treatments.	
	Monitoring and coordination of patient care	
506	I monitor medications and prescriptions of patients digitally.	
507	Track progress of patients using electronic monitoring tools or digital health records.	
508	I schedule and manage patient appointments using digital tools.	
509	I use mobile apps or online portals to track patients' adherence to treatment plans; reminders for medication adherence.	
510	I remotely monitor patients through digital health tools, such as wearable devices/mobile health apps.	
	Supporting provision of health service	
511	I access digital resources to stay updated on medical research and guidelines relevant to my practice.	
512	I use digital platforms to collect and analyze patient data for clinical research purposes.	
513	I participate in virtual meetings or telemedicine sessions with patients for consultations.	
514	I manage my workflow and time using mobile or web-based applications.	
515	Which of the following digital health tools do you currently use? (Choose all that applies)	1. Electronic medical record 2. Mobile health application 3. Telemedicine platforms 4. Health information system 5. Wearable devices 6. Other ----- 7. None

We have finished the questionnaire. Thank you for your time and cooperation.

Annex 4: Amharic Participant Information Sheet

አዲስ አበባ ዩኒቨርሲቲ

የጤና ሳይንስ ኮሌጅ፡ የሕብረተሰብ ጤና ትምህርት ቤት

የመረጃ ቅፅ

ጤና ይስጥልኝ! ስሜ ----- እባላለሁ። የመጣሁት ከአዲስ አበባ ዩኒቨርሲቲ፣ የጤና ሳይንስ ኮሌጅ የጤና ሥርዓት አስተዳደርና ፖሊሲ ትምህርት ክፍል ነው። ለማድረግ የመመረቂያ ፅሁፍ ጥናት በአዲስ አበባ በሚገኙ የመንግስት የማስተማሪያ ህኪም ቤቶች ውስጥ በሚገኙ ህኪሞች የዲጂታል ጤና ማንበብና መጻፍ ችሎታ ደረጃቸውን እና ከዲጂታል ጤና አሠራር ጋር ያለውን ትስስር ለማጥናት መጠይቆችን በመጠቀም ከሐኪሞች መረጃ ለመውሰድ ነው።

የጥናቱ ዓላማ - የሐኪሞችን ዲጂታል ጤና ማንበብና መጻፍ ደረጃ እና በአዲስ አበባ በተመረጡ የመንግስት የማስተማሪያ ሆስፒታሎች ውስጥ ከዲጂታል ጤና አሠራር ጋር ያለውን ግንኙነት ለመገምገም ነው። የዚህ ጥናት ግኝቶች የጤና አጠባበቅ አገልግሎቶችን ዲጂታይዜሽን ለማሻሻል እና የሃኪሞችን የዲጂታል ጤና ልምድ ለማሳደግ እንደግብአት ይጠቅማሉ።

ሂደቶች - የጥናት ተሳታፊዎች ምርጫ በዘፈቀደ ስለሚሆን በዚህ ጥናት ውስጥ በአጋጣሚ ለመሳተፍ ተመርጠዋል። መረጃ ሰብሳቢው ስለጥናቱ ዓላማ ያሳውቅዎታል እና ለመሳተፍ ከተስማሙ፣ ስለዲጂታል መሳሪያዎች ተደራሽነት፣ ስለዲጂታል ጤና መጻፍ ልምድ እና ስለ ዲጂታል የጤና መሳሪያዎች ያለዎትን አመለካከት በተመለከተ በራስዎ የሚተዳደር መጠይቅ መሙላት ይጠበቅብዎታል። መጠይቁን ለመሙላት የሚያስፈልግዎት ጊዜ 20-25 ደቂቃ ነው።

ጥቅሞች - በዚህ ጥናት ውስጥ በመሳተፍዎ ምንም ልዩ ጥቅም አያገኙም።

ስጋት - በዚህ ጥናት ውስጥ ያለዎት ተሳትፎ በምንም መልኩ እርሶ ላይ ጉዳት አያስከትልም።

የተሳታፊዎች መብቶች - ተሳትፎሙ ለመቆየት በፈቃደኝነት ላይ የተመሰረተ

ነው። መሳተፍካል ፈለጉት ማንኛውንም ጥያቄ መለስ የለብዎትም ወይም ይህንን መጠይቅ በማንኛውም ጊዜ መሙላት ለማቆም መብት አለዎት እናም እርስዎ የሚወስኑትን ውሳኔ አክብራለሁ። ነገር ግን ያቀረቡት መረጃ ግብን ለማሳካት በእጅጉ ይረዳል።

ምስጢራዊነት -

እርስዎ ያቀረቡት መረጃ በጥብቅ ሚስጥራዊ እና ለምርምር ዓላማ ብቻ እንደሚውል ላረጋግጥልዎ እፈልጋለሁ። በመጠይቁ ላይ ስምስለ ማይጻፍ ምላሾችዎ የማይታወቁዎታል።

ለእርስዎ ግልጽ ያልሆኑ ማንኛውንም ጥያቄዎች እንዲብራራልዎ መጠየቅ ይችላሉ። ለተጨማሪ ማንኛቸውም ጥያቄዎች ወይም ስጋቶች የጥናቱን ዋና ተመራማሪ በሞባይል ስልክ ቁጥር 0912333810 ማነጋገር ወይም ሃሳብዎን በኢሜል፡ semarefine@gmail.com ብለው መላክ ይችላሉ።

በመረጃ የተደገፈ የስምምነት ቅጽ

የጥናቱን ዓላማ፣ ስጋት፣ ጥቅም አንብቤ ተረድቻለሁ እንዲሁም በማንኛውም ጊዜ በፈቃደኝነት ለመሳተፍ እና ከጥናቱ የመውጣት ምርጫን ተረድቻለሁ።

ከላይ ያገኙትን መረጃ ግምት ውስጥ በማስገባት በዚህ ጥናት ውስጥ ለመሳተፍ ፈቃደኛ ነህ/ሽ? 1. አዎ

2. አይ

ፊርማ _____ ቀን _____

Annex 5: Amharic Version Questionnaire

ህኪሞች በራሳቸው እንዲሞሉት የተዘጋጀ መጠይቅ

የመጠይቅ መለያ ቁጥር ----

የሆስፒታሉ ስም ----

የቃለ መጠይቁ ቀን ----

ክፍል 1. ማህበራዊ እና ስነ-ሕዝብ ባህሪያት

መመሪያ: እባክትን ከእርስዎ ሁኔታ ጋር የሚስማማውን ቁጥር በዝርዝር ውስጥ ከቀረቡት ምርጫዎች ውስጥ ይምረጡ እና ያክብቡ።

ተ.ቁ	ጥያቄ	የመልስ አማራጮች	ወደ ሚቀጥለው ይለፉ
101	ዕድሜ	1. 20-29 2. 30-39 3. 40-49 4. >= 50	
102	ጾታ	1. ሴት 2. ወንድ	
103	የስራ ልምድ	1. >1 ዓመት 2. 1-5 ዓመት 1. 6-10 2. >10	
104	የሙያ ደረጃ	1. አጠቃላይ ሐኪም 2. ፊዚደንት 3. ስፔሻሊስት	

ክፍል 2 ፤ የዲጂታል ቴክኖሎጂዎች መዳረሻ

መመሪያ፤ በዚህ ክፍል እባኮትን ከዝርዝሩ ውስጥ በትክክል ከአሁኑ ሁኔታዎ ጋር የሚስማማውን ምርጫ ይምረጡ።

ተ.ቁ	ጥያቄ	የመልስ አማራጮች	ወደሚቀጥለው ይለፉ
201	የትኞቹን ዲጂታል መሳሪያዎች ማግኘት ይችላሉ? (የሚመለከተውን ሁሉ ይምረጡ)	1. ዴስክቶፕ 2. ላፕቶፖች 3. ዘመናዊ ስልኮች 4. ዲጂታል የሕክምና መሣሪያ እንደ ስማርት ሰዓት ፣ ኤሌክትሮኒክ መዝገብ	
202	በስራ ክፍልዎ ውስጥ ኮምፒተር አለዎት?	1. አዎ 2. የለም	
203	የበይነመረብ መዳረሻ አለ?	1. አዎ 2. የለም	አዎከሆነወደ 204 ይቀጥሉ። ካልሆነወደ 205 ይዝለሉ
204	የበይነመረብ መዳረሻ ከየት ነው የሚያገኙት?	1. የሞባይል ዳታ 2. የግል ዋይፋይ 3. የስራ ቦታ 4. ኢንተርኔት ቤት	
205	በስራ ቦታዎ እንደ ኤሌክትሮኒክ የጤና መዝገብ ፣ የጤና መረጃ ስርዓት ያመሰሉ ዲጂታል መሳሪያዎችን ያገኛሉ?	1. አዎ 2. የለም	አዎከሆነወደ 206 ይቀጥሉ። ካልሆነወደ 208 ይዝለሉ
206	ለጥያቄ ቁጥር 205 አዎ ከሆነ የትኛውን ዲጂታል መሳሪያ ያገኛሉ?	_____	
207	በስራ ላይ ያሉዎት የዲጂታል መሳሪያዎች በጥሩ ሁኔታ ላይ ናቸው?	1. አዎን ሁል ጊዜ 2. በአብዛኛው 3. በጥሩ ሁኔታ ላይ ፤ አልፎ አልፎ 4. አይ፣ ብዙ ጊዜ የማይሰራ 5. አላውቅም	
208	በዲጂታል ቴክኖሎጂ ላይ ስልጠናዎችን ወስደዋል?	1. አዎ 2. የለም	

ክፍል 3፤ የዲጂታል ጤና ማንበብና መጻፍ ችሎታ

ከታች ላለው ለእያንዳንዱ ጥያቄ በጥንቃቄ እና ምላሹን በተሻለ ሁኔታ የሚወክለውን ይምረጡ። መጠይቁ ከዲጂታል ጤና ማንበብና መጻፍ ጋር የተያያዙ የእርስዎን በመስመር ላይ/አንላይን የጤና መረጃን ለመፈለግ እንዲሁም ከዲጂታል ምንጮች ጋር የመስተጋብር ቀላልነት፤ ተሞክሮዎች እና ችሎታዎች ለመገምገም ከ"በጣም አስቸጋሪ" እስከ "በጣም ቀላል" ያለውን ሚዛን ይጠቀማል። ለሚገለጽሎት ተግባራት ደረጃዎን በትክክል የሚያንፀባርቀውን አማራጭ ምልክት በማድረግ (✓) ይምረጡ። አሁን ባሎት እውቀት እና ልምድ ላይ በመመስረት ሁሉንም ጥያቄዎች ይመልሱ። እባክዎን ትክክለኛ ወይም የተሳሳተ መልስ እንደሌለ ያስተውሉ፤ አስተያየትዎን ለማወቅ ብቻ ነው ።

ተ.ቁ	ጥያቄ	የመልስ አማራጮች			
		በጣም ቀላል (4)	ቀላል (3)	አስቸጋሪ (2)	በጣም አስቸጋሪ (1)
	የመረጃ ፍለጋ				
301	በበይነመረብ ላይ መረጃ ሲፈልጉ አጋዥ የጤና ምንጭ ማግኘት መቻል?				
302	በመስመር ላይ/ከኢንተርኔት ከሚያገኙት መረጃ ሁሉ ምርጫ ማድረግ?				
303	በዲጂታል የሚፈልጉትን ጠቃሚ መረጃ ለማግኘት ተገቢውን የቃላት/የፍለጋ ጥያቄ መጠቀም?				
304	በመስመር ላይ/ከኢንተርኔት ላይ የሚፈልጉትን ትክክለኛ መረጃ ማግኘት መቻል?				
	በራስ የመነጨ ይዘት መጨመር				
305	በመስመር ላይ ወይም ዲጂታሊ ጥያቄን ማዘጋጀት መቻል?				
306	ዲጂታሊ በጽሁፍ አስተያየቶችን፣ ሀሳቦችን ወይም ስሜቶችን መግለጽ ወይም ማስተላለፍ?				
307	መልእክትህን እንደፈለከው መረዳት እንዲችል ዲጂታል መድረኮችን በመጠቀም መፃፍ ትችላለህ/ያለሽ?				
	አስተማማኝነትን መገምገም				
308	የዲጂታል መረጃው አስተማማኝ መሆኑን ወይም አለመሆኑን ለመወሰን መቻል?				
309	የዲጂታል መረጃው ከንግድ ፍላጎቶች ጋር መጻፉን መረዳት መቻል?				

310	የመረጃን ተመሳሳይነት ለማረጋገጥ ብዙ ድረገጾች መፈተሽ?				
	ተዛማጅነት መወሰን				
311	የዲጂታል መረጃው ተግባራዊ መሆን አለመሆኑን መወሰን?				
312	በዕለት ተዕለት ሕይወት ውስጥ የዲጂታል መረጃን መተግበር?				
313	ከጤና ጋር የተያያዙ ውሳኔዎችን ለማድረግ ከዲጂታል መንገድ የሚገኙ መረጃውን መጠቀም?				
314	የጤና አጠባበቅ አገልግሎቶችን ማስፋፋት ወይም የታካሚ ቁጥር መጨመርን ለመደገፍ የጤና አጠባበቅ መረጃን ማስተዳደር?				

ክፍል 4 ፤ ዲጂታል ጤና አመለካከት

መመሪያ: እባኩትን ምልክት (✓) በማድረግ ስለዲጂታል ጤና ያለዎትን አመለካከት የሚከተሉትን ጥያቄዎች ያጠናቅቁ።

ተ.ቁ	ጥያቄ	የመልስ አማራጮች				
		በጣም እስማማለሁ (5)	እስማማለሁ (4)	አልወሰንኩም (3)	አልስማማም (2)	በጣም አልስማማም (1)
401	በኮምፒውተር ወይም ስማርትፎን ላይ ቀጠሮ መያዝ ለእኔ የበለጠ ምቹ ነው።					
402	ቴክኖሎጂን መጠቀም የጤና እንክብካቤን አሻሽሏል ብዬ አስባለሁ።					
403	የጤና ቴክኖሎጂን እንዴት መጠቀም እንዳለብኝ በትክክል ተረድቻለሁ።					
404	ከታካሚዎቹ ጋር የቪዲዮ እና የስልክ ቀጠሮዎች በአካል መገናኘትን ያህል ጥሩ ናቸው።					
405	የጤና ቴክኖሎጂዎች ለመጠቀም ቀላል ናቸው።					
406	ታካሚዎች እና ሆስፒታሎች በቴክኖሎጂ ላይ በጣም ጥገኛ ናቸው።					
407	ቴክኖሎጂ እውነተኛ የጤና ባለሙያዎችን ሊተካ አይችልም።					
408	በጤና እንክብካቤ ውስጥ ተጨማሪ የቴክኖሎጂ አጠቃቀምን ማየት አፈላጋለሁ።					

409	የጤና ቴክኖሎጂ የመቆረጥ ዕድሉ አነስተኛ ነው፤ እና ስራዬ አይጎዳም።					
410	የጤና ቴክኖሎጂ የሰዎችን ስህተት ይቀንሳል።					
411	የአንላይን የቀጠሮ አሰራርን ለመጠቀም ማሰቡ ዘና እንዲል አድርጎኛል።					
412	በጤና ቴክኖሎጂ ውስጥ አዳዲስ ለውጦችን ማየት አስደሳች ነው።					
413	ብዙ ጊዜ የጤና ቴክኖሎጂን እጠቀማለሁ።					
414	የጤና ቴክኖሎጂ ለሁሉም ሰው ጥሩ ነው።					
415	ቴክኖሎጂ የሕክምና መዝገቦችን በምስጢር እንደሚይዝ እርግጠኛ ነኝ።					
416	የጤና ቴክኖሎጂን መጠቀም ያስደስተኛል።					

ክፍል 5 ፤ ዲጂታል የጤና አጠቃቀም

መመሪያ: ከታች ላለው ለእያንዳንዱ ጥያቄ፣ አጠቃቀምዎን በተሻለ ሁኔታ የሚወክለውን ምላሽ በጥንቃቄ ይምረጡ። አሁን ባለው ልምድዎ ላይ መመስረት ሁሉንም ጥያቄዎች ይመልሱ።

ተ.ቁ	ጥያቄ	የመልስ አማራጮች			
		በጭራሽ(1)	አንዳንዴ(2)	ብዙ ጊዜ(3)	ሁሌም(4)
501	የታካሚ መዛግብትን ወይም የሕክምና ታሪክን ለመገምገም የኤሌክትሮኒክ የጤና መዝገቦችን እጠቀማለሁ።				
502	ክሊኒካዊ ውሳኔዎችን ለማድረግ የላብራቶሪ ውጤቶችን ወይም የምርመራ ምስልን በዲጂታል መንገድ አገኛለሁ።				
503	በምርመራ ጊዜ የውሳኔ ድጋፍ ሰጪ መሳሪያዎችን ወይም ሶፍትዌርን እጠቀማለሁ።				
504	ከሌሎች እንደ ፋርማሲስቶች፣ የላቦራቶሪ ቴክኒሻኖች እና ነርስ የጤናባለሙያዎች ጋር በዲጂታል መድረኮች ስለታካሚ ተዛማጅ ውይይቶች አደርጋለሁ።				
505	ታካሚዎችን ስለ ጤና ሁኔታቸው ወይም ህክምናዎቻቸው ለማስተማር ዲጂታል የጤና መሳሪያዎችን እጠቀማለሁ።				

	ከትትል እና ቁጥጥር	
506	የታካሚዎችን መድሃኒቶች እና ማዘዣዎች በዲጂታል መንገድ እከታተላለሁ.	
507	ኤሌክትሮኒክ መከታተያ መሳሪያዎችን ወይም ዲጂታል የጤና መዝገቦችን በመጠቀም የታካሚዎችን እድገት እከታተላለሁ.	
508	ዲጂታል መሳሪያዎችን በመጠቀም የታካሚ ቀጠሮዎችን እና ክትትል አስተዳድራለሁ።	
509	የሞባይል መተግበሪያዎችን ወይም የመስመር ላይ መገናኛዎችን ታካሚዎችን የህክምና ዕቅዶች መከተልን እዲሁም ለመድኃኒት ማስታወሻነት/ማሳሰቢያዎች እጠቀማለሁ.	
510	እንደ የሞባይል የጤና መተግበሪያዎች ወይም ተለባሽ መሳሪያዎች ባሉ በዲጂታል የጤና መሳሪያዎች አማካኝነት ታካሚዎችን በርቀት እከታተላለሁ።	
	የጤና አገልግሎት አቅርቦትን መደገፍ	
511	በሕክምና ምርምር እና ከሙያዬ ጋር ተዛማጅነት ባላቸው መመሪያዎች ላይ ወቅታዊ መረጃ ለማግኘት የዲጂታል ግብዓቶችን ላይ እፈልጋለሁ።	
512	የታካሚ መረጃዎችን ለክሊኒካዊ ምርምር ዓላማዎች ለመሰብሰብ እና ለመተንተን ዲጂታል መድረኮችን እጠቀማለሁ።	
513	ከታካሚዎች ጋር ምክክር ለማድረግ በቨርቹዩል ስብሰባዎች ወይም በቴሌሜዲስን ውይይቶች ላይ እሳተፋለሁ።	
514	በሞባይል ወይም በድር ገፅ ላይ የተመሰረቱ መተግበሪያዎችን በመጠቀም የስራ ፍሰቴን እና ጊዜዬን አስተዳድራለሁ።	
515	በአሁኑ ጊዜ ከሚከተሉት ዲጂታል የጤና መሳሪያዎች ውስጥ የትኛውን ይጠቀማሉ? (የሚመለከተውን ሁሉ ይምረጡ)	1. ኤሌክትሮኒክ የሕክምና መዝገብ 2. የሞባይል ጤና መተግበሪያ 3. የቴሌሜዲስን 4. የጤና መረጃ ስርዓት 5. ተለባሽ መሳሪያዎች 6. ሌላ ----- 7. የለም

ጥያቄዎችን ተጠናቀዳል። ለትግዕስ እና ለጊዜዎ ክልብ አመሰግናለሁ።

