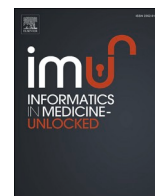




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# Telemedicine use during COVID-19 pandemics and associated factors among health professionals working in health facilities at resource-limited setting 2021

Bayou Tilahun Assaye<sup>a,\*</sup>, Aynadis worku Shimie<sup>a</sup>

<sup>a</sup> Department of Health Informatics, College of Health Science, Debre Markos University, Debre Markos, Ethiopia

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## ABSTRACT

**Background:** Digitizing healthcare has been a potential solution for transforming healthcare service delivery in the era of COVID-19 pandemics. To limit and minimize the virus spread, telemedicine helps control and prevent the pandemic by delivering healthcare services over long distances using Information communication technology. The objective of the study was to determine the level of telemedicine utilization among health professionals in the era of the COVID-19 Pandemic and the factors associated with it.

**Methods:** An institutional-based cross-sectional study design was used to collect data from 845 healthcare professionals. A pilot study was conducted on 5% of the study participants before the actual data collection process. After completion, changes were made based on the pilot study results, and a Cronbach alpha value of 0.76 was obtained. Descriptive and binary logistic regression models were used. Variables with a P-Value of less than or equal to 0.2 from the bivariable analysis were entered into the multivariable analysis. The odds ratio, 95% confidence interval, and p-value less than 0.05 were used to interpret a significant association, Hosmer-Lemeshow goodness-of-fit test, and the multicollinearity test were used to assess the assumptions.

**Result:** 64.2% of the respondents had good use of telemedicine during COVID-19 with a response rate of 87.2%. 507 (62.8%) were male, and 525(71.2%) reported by nearly threefold (AOR = 2.96, % CI: [1.54–5.76]), IT support staff in the health facility (AOR = 8.32, 95 %CI: [4.77–14.52]), ICT training (AOR = 4.15, % CI: [2.13–8.02]), the frequency of searching health information (AOR = 6.19, % CI: [2.12–18.07]), and social media used (AOR = 3.46, % CI: [1.43–8.32]) were found significantly associated with health professionals' use of telemedicine.

**Conclusion:** The majority of healthcare providers practice telemedicine to control and prevent the spread of the COVID-19 virus. However, the availability of the internet, the presence of IT support staff, ICT training, the frequency of searching for health information, and the use of social media were significantly associated with the level of telemedicine utilization. Initiatives for full implementation of telemedicine in the health facility and motivating the health professionals are needed to carry out their medical practice by providing training and improving internet access in health facilities.

## 1. Background

Long-distance healthcare delivery has the potential to improve healthcare service delivery in the era of the COVID-19 pandemic [1,2]. Telehealth, which makes use of information and communication technology, allows us to access a remote healthcare service without the need for physical contact [3].

Telemedicine is a modality of delivering healthcare services across geographical boundaries, promoting and facilitating healthcare access

[4]. More ever, telemedicine is an important tool for the amplification of healthcare delivery using smartphones or advanced technology via email or video conferencing, especially for providing and supporting clinical care remotely [5–7].

The digital divide is not caused solely by a lack of Internet access. A combination of technology and in-person services can help to address some of this disparity. The COVID-19 pandemic will alter the way we deliver health care, and we anticipate greater reliance on and integration of technology in the future [8].

\* Corresponding author.

E-mail address: [bayutilahun5@gmail.com](mailto:bayutilahun5@gmail.com) (B.T. Assaye).

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During the lockdown measure in Africa, the primary strategies during the COVID-19 pandemic were to limit the transmission and negative impacts on the community by using different control and prevention mechanisms [9,10]. One of the control and prevention mechanisms was using a telemedicine system [9,11]. However, particularly developing countries, have failed to sustain and integrate with the healthcare system even during COVID-19 pandemics, in which the accessibility to medical and specialty services is normally expensive and risky to providing high-quality face-to-face health services for the community [10,12,13].

Furthermore, in the absence of in-person visits during the pandemic, telemedicine can be used to supplement healthcare service delivery [14]. This will aid in maintaining physical distance to provide patient care via cell phone, computer, or other advanced technology [15]. It is troubling that telemedicine has not been fully implemented in developing countries, particularly in Ethiopia. Potential barriers included limited or inconsistent internet access and a lack of training [16,17]. According to the previous study conducted in Addis Ababa, 40.6% of health professionals used telemedicine services. However, this study did not depict the factors influencing and associated with telemedicine utilization in Ethiopia [18,19].

In response to the coronavirus pandemic (COVID-19), Ethiopia's ministry of health has set an initiative to use E-health to control disease spread by using telemedicine modalities and rising the role of digital health as a much-needed aspect of medical service delivery in the referral system [20–22]. However, it was unclear why telemedicine has not been readily utilized in clinical and non-clinical services [23,24].

Telemedicine facilitates the delivery of ongoing medical services, communication with family members while in quarantine, mental health awareness-raising, as well as toxicovigilance and infection control. The lack of a supporting telemedicine framework and digital barriers to patient and healthcare personnel biases hampered the country's telemedicine implementation [25,26].

Despite the potential benefits of telemedicine and the rapid advancement of the e-health industry in developed countries, the implementation of a telemedicine system for disease control and prevention has not progressed as expected, particularly in Ethiopia [16]. Topics such as patient consultation, remote monitoring, and support for health care providers remain unexplored [9,22,26–28]. Despite Ethiopia's Ministry of Health's commitment to health care quality and telemedicine, what factors have a significant impact on healthcare professionals' use of telemedicine?

The finding of the study is vital for health professionals, and governmental and non-governmental health care organizations that enable them to update healthcare strategies, plan appropriate training, and its insights a linking among medical institutions. Therefore, the sustainable integration of the telemedicine system within clinical practice depends on the constant evaluation of health professionals' level of telemedicine use during the COVID-19 pandemic.

The objective of this research was to determine the level of telemedicine utilization in the era of the COVID-19 Pandemic and its factors among health professionals working in public healthcare facilities.

## 2. Methods and materials

### 2.1. Study design, setting, and period

An institutional-based cross-sectional study design was conducted from October December 2020 to February August 2021 among health professionals working at a public health facility in Addis Ababa, which is the capital city of the Ethiopia and Africa union. There are more than 4 million people, 80 public health and 50 private health facilities in the city, and more than twenty thousand health professionals working in the city.

### 2.2. Source and study populations

The source population consisted of all health professionals working at public health facilities in the Addis Ababa city administration in the year 2020, while the study population consisted of those working in the administration's selected facilities and available during the data collection period.

### 2.3. Inclusion and exclusion criteria

All selected health professionals working at government health facilities in Addis Ababa and available during data collection time were included in the study. However, health professionals who were seriously ill, unable to respond, and positive for COVID-19 were excluded from the study.

### 2.4. Sampling method and sample size

Since there was no previous study in this content area, the single population proportion formula was used to determine the sample size, using a 50% proportion for health professionals. In addition, a 10% non-response rate, a design effect of two, and a marginal error of 5% were applied. Participants in the study were drawn from ten hospitals and two health centers in each sub-city of the Addis Ababa administration. Health professionals were stratified into departments, and each department received a proportionate allocation. A lottery method was used to select 845 study participants using simple random sampling.

### 2.5. Operational definition

Terms	Operational Definition
Health professional:	Employees with at least a diploma certificate in the health professions who provide healthcare services in the study settings were defined as health professionals [29].
Allied and other health professionals:	Midwives, pharmacists, medical laboratory technicians, anesthesia, psychiatry, and health informatics/health information techniques were among the allied and other health professionals included in the study.
Knowledge of e-Health.	Study participants who know, that E-health includes telemedicine, Mobile health, electronic health records, and health information exchange system are categorized as "Yes" and categorized "No" the participant who said e-health does not include telemedicine, Mobile health, electronic health records, and health information exchange system [30]
Telemedicine system	the use of ICT infrastructure to support long-distance clinical health care and public health education through the use of video conferencing, the internet, email, store-and-forward imaging, and wireless communications (online or offline) [31,32].
Telemedicine:	is the use of teleconsultation, Tele-education, any mobile-health application, and other telemedicine component that includes interactive video conferencing, a store and forward method, or a remote patient monitoring application ([2,33].
Telemedicine utilization	Study participants who scored above the mean on the 10 "yes" or "No" items (100%) of telemedicine were categorized as good telemedicine utilization and those who scored below the mean were categorized as poor telemedicine utilization [18,34].

### 2.6. Data collection procedures and data quality assurance

#### 2.6.1. Data collection procedures

A structured administrative questionnaire was used to collect the data. The questionnaire was prepared in English that included socio-demographic questions, Basic Computer skills and internet use, and

organizational-related questions, and ten “yes” or “No” items were used to assess telemedicine utilization. The data collectors utilized COVID-19 prevention protocols such as using a mask, and sanitizer and keeping a 2-m distance.

2.6.2. Data quality assurance

A pilot study was conducted on 5% of the study participants before the actual data collection process. After completion, changes were made based on the pilot study results, and a Cronbach alpha value of 0.76 was obtained. Before beginning the actual data collection process, data collectors and supervisors were trained to raise awareness about the study’s purpose, their rights, confidentiality concerns, and how to give respondents enough time to read and fill out materials carefully. Throughout the data collection process, there was constant supervision, and both the supervisor and the investigator double-checked the consistency and completeness of the data. To reduce data duplication and loss, a backup system was also used.

2.6.3. Data processing and analysis

Data were cleaned and entered into Epi-info-version 7 software before being exported to the Statistical Package for Social Science (SPSS-version 20) for analysis. Descriptive analysis was completed for socio-demographic variables, and binary logistic regression was used to examine the relationship between the independent variable and the dependent variable. Variables with a P-Value of less than or equal to 0.2 from the bivariable analysis were entered into the multivariable analysis to identify those associated with telemedicine utilization. The odds ratio, 95% confidence interval, and P-value less than 0.05 were used to interpret a significant association, the Hosmer-Lemeshow goodness-of-fit test was used to test the model fitness, and multicollinearity was checked between independent variables by using variance inflation factors(VIF).

3. Result

3.1. Sociodemographic characteristics of health professionals

87.2% of the study participants completed the questionnaire with a mean age of 31.32 + 7.33 SD years, and the majority of respondents were between the ages of 20 and 29. 507(62.8%) of all study participants were male, and the majority of respondents had bachelor’s degrees 380 (51.6%). In terms of occupation, 150 (20.4%) were medical doctors, while 155 (21.0%) were nurses and the nearest half of the study participant was allied and other health professionals. The mean working experience was 3 + 1.2 SD years and nearly half of the respondents (341, 46.3%) had 1–5 years of experience. The majority of participants(701 [95.1%]) stated that their computers perform various internet-related tasks (42.8%) (Table 1).

The results showed that 150(20.4%) of the participants were medical doctors, and 68.7% of these medical doctors had good telemedicine utilization. Similarly, 155(21%) of the study participants were nurses, and 83(53.5%) of those nurses reported having good telemedicine utilization (Fig. 1).

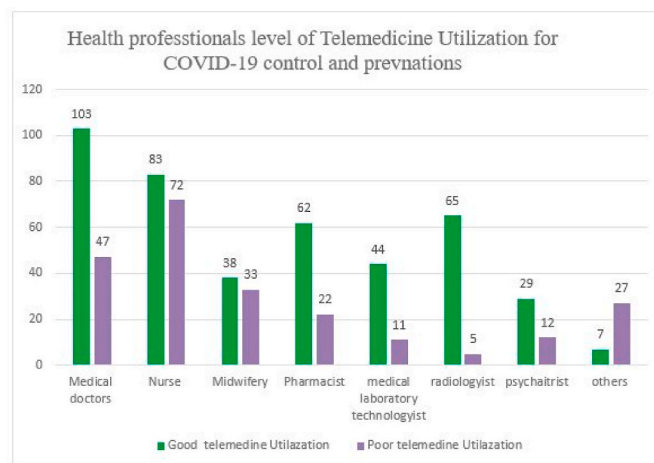
3.2. Health professional’s basic computer skills and internet use

More than half of 457 (62.0%) of the respondents had an introductory level of ICT training, 701(95.1%) used their computer, laptop, or smartphone for work, and sometimes 321 (43.6%) of the study participants searched for information online for getting information. 584 (29.4%) of the study participants were requested by the patients for online advice during the COVID-19 pandemic. 238 (32.3%) of the study participants interacted with patients via e-mail or social media. [Table 2].

**Table 1**  
Socio-demographic characteristics of the health professional at Addis Ababa public health facility, Central Ethiopia 2021 (N = 737).

Variables	Categories	Frequency (#)	Percentages (%)
Gender	Male	507	62.8%
	Female	230	31.2%
Age (years)	20–29	350	47.4%
	30–39	314	42.5%
	Age>40	73	9.9%
Professional	Medical Doctor	150	20.4%
	Nurse	155	21.0%
	Radiologic technologists	70	9.5%
	Allied and other health professionals	362	49.1%
Educational status	Specialist	80	10.9%
	Resident	44	6.0%
	GP	42	5.7%
	Master’s Degree	166	22.5%
	Bachelor degree	380	51.6%
	others	25	3.4%
Work experience (years)	<5	341	46.3%
	6–10	169	22.9%
	11–15	71	9.6%
	>16	156	21.2%

\*Other1 = Diploma, Ph.D..



**Fig. 1.** Level of telemedicine utilization among health professionals working at public health facilities.

3.3. Health professional’s level of understanding of E-health

More than two-thirds of 497 (67.4%) participants were familiar with health care digitization, or E-health, and reported the source of information was from the internet, 505 (23.3%). More specifically, 306 (60.59%) had accessed websites related to telemedicine on the Internet. 555 (75.3%) of the respondents shared information with their friends, consulate health care providers, and patients during the COVID-19 pandemic. 627 (85.1%) of respondents were aware of the factors that impede the use of telemedicine services in the health facility. 576 (25.56%) of study participants reported that a lack of telemedicine awareness and 524 (23.25%) a lack of E-health professionals were factors that hindered the use of telemedicine systems(Table 3).

3.4. Organizational factors for the use of telemedicine

The majority of study participants, 514 (69.7%), had enough computers for their work; 525 (71.2%) had internet access within their health facility, and 241 (45.90%) had both Wi-Fi and broadband internet access. Similarly, 555 (75.3%) of respondents reported a culture

**Table 2**  
Basic Computer skills and internet use among health professionals public health facility, Central, Ethiopia 2021 (N = 737).

Variable categories		Frequency (#)	Percentages (%)
ICT Training	Introductory level	457	62%
	Certificated in the ICT	102	13.8%
	Never attended training in the ICT	178	24.2%
Accessibility of Computers,	Yes	701	95.1%
	No	36	4.9%
Activities Performed By their Computers	Microsoft-office	317	21.0%
	Internet access	647	42.8%
	Entertainment like use social media	492	32.6%
	Others	54	3.6%
Frequency of Search Health Information on the Internet	Always	95	12.9%
	Often	233	31.6%
	Sometimes	321	43.6%
	Rarely	13	1.8%
	Never	75	10.2%
Reasons for Searching Information on Internet	Obtaining information to give patients care	584	29.7%
	Patient consultation	541	27.5%
	Literature search	495	25.1%
	Maintaining knowledge and skills	349	17.7%
	Others	54	3.6%
Frequency of Interact with Patients via e-mail Or through Social Media	Always	145	19.7%
	often	127	17.2%
	Sometimes	238	32.3%
	rarely	128	17.4%
	Never	99	13.4%
Requested by Patients For Online Advice During The Covid-19 Pandemic	Yes	578	78.4%
	No	159	21.6%

**Table 3**  
Level of understanding of e-Health Among health professionals at a public health facility, Central Ethiopia 2021 (N = 737).

VARIABLE	CATEGORIES	FREQUENCY (#)	PERCENTAGES (%)
KNOWLEDGE OF E-HEALTH.	Yes	497	67.4%
	No	240	32.6%
SOURCE OF INFORMATION FOR E-HEALTH	Internet	505	23.6%
	Colleagues	456	21.3%
TRAINING/Conference	Medical Literature	364	17.0%
	Professional	273	12.7%
	Seminar/Workshop	277	12.9%
	Radio Or Tv	267	12.5%
VISITING WEBSITE RELATED TO TELEMEDICINE	Yes	306	60.59%
	No	199	39.41%
INFORMATION SHARING DURING COVID-19	Yes	555	75.3%
	No	182	24.3%
TYPE OF TELEMEDICINE APPROACH	Store And Forward	531	29.3%
	Real-Time	333	18.45%
	Remote Patient	373	20.6%
	Monitoring Communication	553	30.6%
	Via Telephone	20	1.1%
	I Don't Know	20	1.1%

of information sharing with other health care providers or patients. The majority of participants (461, or 62.6%) attended E-health training, and 498 (67.6%) had IT, support staff, in their health facility (Table 4).

**Table 4**  
Organizational-related variables among health professionals at Addis Ababa public health facility, Central Ethiopia 2021 (N = 737).

VARIABLE CATEGORIES		FREQUENCY (#)	PERCENTAGES (%)
ACCESSIBILITY OF COMPUTERS	Yes	514	69.7%
	No	223	30.3%
INTERNET ACCESS	Yes	525	71.2%
	No	212	28.8%
TYPE OF INTERNET ACCESS	Wi-Fi	182	34.66%
	Broadband	102	19.42%
	Both	241	45.90%
TRAINING IN THE E-HEALTH	Yes	461	62.6%
	No	276	37.4%
ICT SUPPORTING STAFF	Yes	498	67.6%
	No	239	32.4%

**3.5. Factors associated with the use of telemedicine among health professionals**

64.2% of the study participants (95% CI: [60.7, 67.4]) had good use of telemedicine during COVID-19. Internet access, ICT training, the frequency of searching health information, the frequency of using social media, and having IT support staff in their health facility were all found to be significantly related to the level of telemedicine utilization among health professionals. As a result, study participants who always searched for health information were six times more likely to use telemedicine than those who were never searching for health information during COVID-19 pandemics (AOR = 6.19, 95%CI: [2.13–18.07]).

Health professionals with IT support in their health facility were 8.32 times more likely to use telemedicine for COVID-19 control and prevention than those without (AOR = 8.32, 95% CI: [4.77–14.52]). Furthermore, health professionals who had received ICT certification were 4.15 times more likely to have high levels of telemedicine utilization than those who had never received ICT training (AOR = 4.15, 95% CI: [2.13–8.02]).

Participants in the study who had internet access in their health facility were 2.98 times more likely to use telemedicine than those who did not have internet access in their hospitals (AOR = 2.986, 95% CI: [1.54–5.78]). Health professionals who used social media regularly were 11.90 times more likely to demonstrate good telemedicine utilization than those who did not (AOR = 11.90, 95% CI: [5.29–26.72]) (Table 5).

**4. Discussion**

64.2% of the study participants (95% CI: [60.7, 67.4]) had good use of telemedicine during COVID-19. The finding indicated that health professionals practice the telemedicine system by using various approaches of telemedicine such as online, store and forward, telephone consultation, and other e-health platforms. Specifically, health professionals mostly used Tele-education and teleconsultation services in hospitals to support and deliver health services. As a result of the COVID-19 pandemic, the use of telemedicine to provide health care services to patients became more popular to prevent the spread of the virus. Many studies were recently conducted, implying the wide and beneficial use of telemedicine to manage many patients' health care problems.

Even though telemedicine has been becoming more popular to control and prevent communicable diseases in the developed country than in developing countries [35], this study shows us that resource-limited settings had the potential to be fully integrated into the healthcare system to facilitate and deliver healthcare services to rural and remote communities [36]. The finding revealed that the use of telemedicine technologies provides adequate information about the pandemic and aid in limiting its spread to communities [19,37]).

The finding is comparable to that conducted in Iran [37] It could be



**Table 5**

Factors associated use of telemedicine among health professionals working at a public health facility, Central Ethiopia 2021 (N = 737).

Variables	Categories	telemedicine Use		COR (95%CI)	AOR (95%CI)
		Good	Poor		
Gender	Male	366	141	2.98(2.15–4.13)	1.55(0.87–2.75)
	female	107	123	1	1
Work experience (years)	<5	238	103	0.82(0.54–1.26)	3.19(.65–6.17)
	6–10	71	98	0.26(0.16–0.41)	2.59(0.62–5.36)
	11–15	49	22	0.79(0.43–1.47)	1.20(0.51–2.87)
	>16	115	41	1	1
Training on ICT	Introductory level	359	98	13.05(8.58–19.86)	4.15(2.13–8.02)*
	Certificated in the ICT area	75	27	9.9(5.63–17.43)	1.25(0.51–3.11)
	never attended ICT training	39	139	1	1
Frequency of searching health information	Always	75	20	12.79(6.16–26.59)	6.19(2.13–18.07)*
	Often	150	83	6.16(3.37–11.27)	7.10(2.68–18.90)*
	Sometimes	255	96	7.99(4.43–14.49)	4.53(1.85–11.09)*
	Rarely	6	7	2.93(0.86–9.87)	0.21(0.13–1.04)
Frequency of use of social media	Never	17	58	1	1
	Always	120	25	15.01(7.98–28.16)	3.46(1.43–8.32)*
	Often	196	42	14.58(8.26–25.57)	0.87(0.37–2.03)
	Sometimes	84	43	6.10(3.39–10.9)	11.90(5.29–26.72)
	Rarely	49	29	1.93(1.08–3.45)	3.73(1.68–8.27)
Health Information sharing during COVID-19	Yes	403	152	4.24(2.98–6.03)	1.63(0.92–2.88)
	No	70	112	1	1
Internet access	Yes	419	106	11.5(7.56–16.82)	2.97(1.54–5.78)*
	No	54	158	1	1
Training on telemedicine/E-health	Yes	225	51	3.79(2.66–5.40)	1.06(0.60–1.87)
	No	248	213	1	1
Availability of ICT supporting staff	Yes	411	87	13.5(9.3–19.5)	8.32(4.77–14.52)***
	No	62	177	1	1

**Note:** 1 = reference; \* \*\* P-value = 0.01, \*, p-value ≤0.05.

the Ministry of Health's Internet access and digitization health initiatives in health facilities. However, it was low in an Australian study [38] that would improve dental practice communication with colleagues and referral of new patients. It might be due to infrastructure differences between developing and developed countries. In contrast to our findings, a study carried out in Saudi Arabia [33] discovered a high level of telemedicine usage. It could be due to differences in e-health literacy and infrastructure between countries.

Telemedicine has reduced the risks of COVID-19 infections for both the client and the provider while also providing access to critical health care services [39]. According to the current study, 69.2% of professionals use social media for patient consultation. This finding is comparable to a study conducted in Lebanon [40] and could be attributed to the government placing a greater emphasis on digital health in the era of the COVID-19 pandemic and opportunities for receiving health care services during a health facility lockdown [41]. This study supported other studies that the practice patterns of telemedicine in response to the COVID-19 pandemic were beneficial to health service delivery and for the prevention and control of this communicable disease remotely helps to identify retrieving misinformation and disinformation.

The findings are consistent with a study conducted in Europe [17], which found that the availability of technology, access to the internet, and technical staff support all have an impact on healthcare providers' use of telehealth. When compared to a previous cross-sectional study conducted in Addis Ababa [2] less than half of the study participants used telemedicine applications. This disparity could be attributed to the passage of time and the government's increased emphasis on ICT in healthcare sectors. Most scholars suggested strategies that could be used to improve internet access and IT support to improve telehealth utilization would be given capacity-building training [42,43].

Dispute the fact that, the finding shows how to minimize barriers and maximize opportunities for healthcare digitization practically in the resource-limited setting, and improving the ICT infrastructure is key to the full implementation of the telemedicine system [44]. However, the combination of technology and in-person services has been found to help

address some of this disparity [8,45]. The study conducted in Lebanon showed that 75.8% of physicians used telemedicine during the onset of the COVID-19 pandemic. However, this study's level is lower than the Lebanese study's [46]. It might be a clear understanding of the telemedicine modality to deliver healthcare services and the lack of supporting staff and shortage of telemedicine training in place of referring a patient, even the accessibility of the Internet has been a major challenge in the era of digitization in developing countries.

The scholars suspected that the COVID-19 pandemic will change the way to deliver health care services and that there will be a greater reliance on and integration of technology going forward. The health system itself is a complex issue that affects the ways to accessibility and adoption of new technologies in the era of COVID-19 pandemics. However, practicing the distance delivery of healthcare services has been a solution to minimize the spread of communicable diseases, especially in developing countries [8,47]. Despite advancements, we will continue to see increasing disparities in healthcare access and outcomes [48] by setting the necessary regulatory framework, this is required to allow health professionals to practice safe, evidence-based telemedicine practices during the COVID-19 pandemic.

## 5. Strengths and limitations

This study is based on cross-sectional data, with large sample size and a relatively good response rate, which contributes to the representativeness of the study sample. The cross-sectional study design prevented the establishment of causation, and the outcomes could be influenced by confounding variables that were not examined. Additionally, there is still a possibility of recall bias, which may affect the results. It was not supported by a qualitative study, and health professionals' level of telemedicine use related to the legal framework that governs telemedicine practice was not thoroughly assessed.

## 6. Conclusion

The majority of healthcare providers practice telemedicine to control

and prevent the spread of the COVID-19 virus. Telemedicine is becoming more popular to control and prevent communicable diseases and has the potential to be fully integrated into the healthcare system. However, internet accessibility, the availability of IT support staff, the frequency of searching for health information, and the use of social media had a significant impact on the utilization of telemedicine.

The government should take the initiative to full implementation of telemedicine in health facilities and motivate health professionals to carry out their medical practice by providing telemedicine training and improving internet access in hospitals and health facilities. Furthermore, a regulatory framework is required to allow practicing evidence-based telemedicine during the COVID-19 pandemic.

### Ethical approval

Ethical approval was obtained from the Ethiopian midwife association's ethical review committee, with ethical approval number "EMwA-IRB/001–2020," as well as support letters from the Addis Ababa health bureau. After explaining the purpose of the study, each participant signed the consent form. The data collection procedure was completely anonymous, and their privacy and confidentiality were respected.

### Consent for publication

All authors agreed and agreed to publication.

### Availability of data and materials

All major data have been presented in the manuscript.

### Funding

The funding body has no role in the design of the study and collection, analysis, interpretation of the data, writing the manuscript, and publication as well.

### Authorship statement

Conception and design of study: BT Assaye. Acquisition of data: BT Assaye, AW shimie. Analysis and/or interpretation of data: BT Assaye, AW shimie, Drafting the manuscript: BT Assaye, AW shimie, Revising the manuscript critically for important intellectual content: BT Assaye, AW shimie, Approval of the version of the manuscript to be published, BT Assaye, AW shimie.

### Declaration of competing interest

The authors declare that they have no conflicts of interest.

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### Abbreviations

BSC	Bachelor of Science
E-Health	Electronic Health
Epi-info	Epidemiological Information
ETB	Ethiopian Birr
FMOH	Federal Ministry of Health
GP	General Practitioners
HI	Health Informatics

HIT	Health Information Technician
HP	Health professionals
MPH	Master of Public Health
ICT	Information communication technology
IT	Information technology
SPSS	Statistical Package for Social Science
WHO	World Health Organization

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