

A longitudinal study reflecting a pandemic-driven revolution of telemedicine in Bangladesh with promising prospects

Abstract

COVID-19 has been a public health crisis for quite a long time worldwide. Providing primary health care during this has proven to be quite difficult. Telemedicine played an imperative part in this by minimizing virus spread and utilizing the time of healthcare experts. This survey was designed to know about the prevalence of telemedicine during Covid-19 pandemic as well as its future prospect in Bangladesh. Four stakeholders were categorized for the study: common people, physicians, pharmaceutical professionals and regulatory body. Data was collected both via online and offline. Among the general people, 50.23% took health services through telemedicine service during the pandemic and 24.64% before the pandemic. Both general people (78.88%) and physicians (60%) expressed their satisfaction regarding the service. 93% pharmaceutical professionals also suggested that telemedicine should be implemented in all hospitals. Among the service takers 100% people were prescribed cold medicines. 58% of the respiratory issues were addressed through telemedicine. Physicians as well as regulatory authority considered raising awareness about telemedicine to be an important factor. Therefore, telemedicine should be utilized in several ways in our health sector. The Post-Covid-19 era presents a unique opportunity for Bangladesh to harness the potential of telemedicine in addressing healthcare disparities and improving access to quality care. While challenges persist, strategic investments, technological innovation, and policy support can ensure that telemedicine becomes a cornerstone of a more equitable and efficient healthcare system in Bangladesh.

Keywords: telemedicine, pandemic, emergence, prospect, prevalence

Volume 14 Issue 1 - 2025

Tasnuma Tabassum,¹ Adeeba Jaheen Faruqui,^{1,2} Sumiya Sharmin Mou,^{1,2} Nasiba Binte Bahar,^{1,2} Fatema-Tuz-Zohora,² Bytul Mokaddesur Rahman,³ Md Elias Al-Mamun¹

¹Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh

²Department of Pharmacy, University of Asia Pacific, 74/A Green Road, Dhaka, Bangladesh

³Department of Pharmacy, Rajshahi University, Rajshahi, Bangladesh

Correspondence: Md. Elias Al-Mamun, Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Dhaka, Dhaka-1000, Bangladesh, Tel 01710857444

Received: January 18, 2025 | **Published:** March 7, 2025

Introduction

On December 1, 2019, after the first reported case of a coronavirus disease in Wuhan, China, coronavirus began spreading rapidly in China, with a similar trend around the world. WHO labeled it a global pandemic.¹ Providing primary health care during this pandemic appeared to be difficult, as facilities were interrupted due to a lack of protective gear, lockdown, and the possibility of infection spreading to patients and medical personnel.² The most recent SARS coronavirus to be identified was SARS corona virus 2 (SARS-CoV-2).³ Governments around the world have worked to put in place countermeasures to prevent potentially devastating results. Researchers throughout the world worked tirelessly to understand more about the processes of transmission, the clinical spectrum of disease, novel diagnostics, and preventive and treatment methods.⁴ Many countries and professional societies have developed evidence-based guideline programs, including the National Institutes of Health's guidelines, which are revised on a regular basis.^{5,6} As the disease progressed, scientists around the world worked hard to create medicines that could be used to fight COVID-19.⁶

Telemedicine, including tele-education, was found to be an efficient way to rationally distribute medical services as health-care resources are strained due to the growing burden of the COVID-19 pandemic.⁷ The word "telemedicine" is derived from the Greek word "tele," which means "from afar" and the contemporary word "medicine," which is derived from Latin word "mederi," which means "healing."⁸ The definition of telemedicine is as follows, according to the World Health Organization (WHO): "The practice of medical care

using interactive audiovisual and data communications including medical care delivery, diagnosis, consultation and treatment, as well as education and the transfer of medical data".⁹ Telemedicine first appeared in Bangladesh before 1999. Many Bangladeshi doctors and surgeons engaged in informal teleconsultation with colleagues in other countries.¹⁰ Telemedicine was designed to treat patients who lived in rural locations far from local health facilities or in areas where medical practitioners were in short supply.¹⁰ In a competitive healthcare world where remaining independent and keeping a healthy bottom line is difficult, telemedicine has rapidly become a way to give medical practices an advantage.¹¹ The following are some of the most common telemedicine specialties- teleradiology, telepsychiatry, teledermatology, teleophthalmology, telenephrology, teleobstetrics, teleoncology, telepathology and telerehabilitation.¹¹

Healthcare organizations who use telemedicine solutions attested to the fact that it takes a significant amount of time and money. To obtain the benefits of the system, practice managers, nurses, physicians, and others must learn how to use it.¹² In spite of these, telemedicine came as a rescue since the rapid transmission of the deadly corona virus has caused an epidemic of fear and hate among people, going to a doctor or hospital for treatment became riskier for all types of patients during the pandemic. It helped to reduce patient wait times, boosted interdepartmental and inter-hospital coordination and collaboration, enabled physicians in Bangladesh and abroad to share best practices and helped with better resource allocation.¹² But high-quality telemedicine service has been provided in different levels of hospitals all over the country during the pandemic at the shortest possible time.¹³

Therefore, the aim of this study was to:

- I. Determine the extent of telemedicine in our country.
- II. Determine the percentage of people using telemedicine service during and after the covid-19 pandemic situation.
- III. Illustrate the effectiveness of telemedicine.
- IV. Learn about the future prospect of telemedicine and recommendations for implementing it in our country.

Material & methods

Stakeholder: The total study population consisted of four different stakeholders having clear concepts and adequate knowledge on the topic of the project. The first and the most important one was general people. Three other stakeholders were physicians, pharmaceutical companies and regulatory authorities.

Study method: The research was carried out using a questionnaire-based survey method. A quantitative & quantitative study like this provided frequency data that was analyzed further using descriptive and inferential statistical tools.

Sampling method: Convenience sampling and simple random sampling were used. Using Cochran’s sample size formula for frequency analysis and categorical variables, the sample size can be shown as follows:

Sample size $n = \{z^2_{\alpha/2} pq\} / d^2 = \{1.96^2 \times .3 \times .7\} / .05^2 = 322.69$, which is equivalent to 323. Here, $Z_{\alpha/2} = 1.96$, $p = 0.3$, $q = (1-p) = 1-0.3 = 0.7$, α is the level of significance that is considered to be 5% and ‘p’ is the proportional value that also done for 0.3% in standard sample determination process. We attempted to keep our data as close to the estimated number as possible.

Sample size: The total number of responses found was 267. The total number of responses for the general population was 220. A total of 31 pharmacists were interviewed. A total of 10 physicians were interviewed. 6 regulatory authorities also responded to their separate questionnaires. The data was collected at the last phase of 2021 as that was the time period the Bangladeshi people started overcoming Covid-19 waves.

Primary data collection: The primary data was collected by a questionnaire-mediated survey method. 4 separate sets of questionnaires were used to collect data from these various segments of stakeholders.

Secondary data collection: Secondary data was collected from various reports, research journals, newspapers, related books, articles and online sources.

Data analysis: Data was processed through MS WORD, MS Excel and SPSS that helped to deal with the descriptive and inferential data. Microsoft Office Excel was used in this regard. Correlation among data were established using statistical tests.

Results

This study consisted of four stakeholders who were: general people (n=220), physicians (n=10), pharmaceutical companies (n=31) and government regulatory bodies (n=6). General people were asked various questions about telemedicine and its use & effectiveness during covid-19 pandemic. Data was obtained from 220 people. The demographic data of common people are shown in Table 1.

Table 1 Demographic characteristics of general people

Characteristics	Frequency (n)	Percentage of respondents %	
Age	Below 20 years	12	5.5
	21-35 years	197	90.4
	36-50 years	6	2.8
	50 years above	3	1.4
Residence	Rural area	34	15.70%
	Urban area	183	84.30%
	Students	170	79.1
Occupation	Government service	3	1.4
	Private sector	31	14.4
	Businessman	6	2.8
	Others	5	2.4

Among 207 general people, 24.64% (n=51) took health service through telemedicine before pandemic and 50.23% during pandemic. But 75.36% (n=156) said that they didn’t take any health service. Among all the respondents, 61.40% (n=35) said that they took health services for respiratory problems before the pandemic via telemedicine. 14.04% (n=8) also said that they took telemedicine service for hypertension. Before the pandemic, telemedicine was used to treat 8.77% (n=5) of diabetic patients and 3.51% (n=2) of kidney patients. In addition, during pandemic, 10.53% (n=6) of patients received health care through telemedicine. On another note, among all the respondents, during the pandemic, 58.10% (n=61) took health services for respiratory problems, 21.90% (n=23) took treatment for covid-19, 7.62% (n=8) hypertensive patients, 4.76% (n=5) diabetic patients also took health services during the pandemic via telemedicine. These are shown in Figure 1.

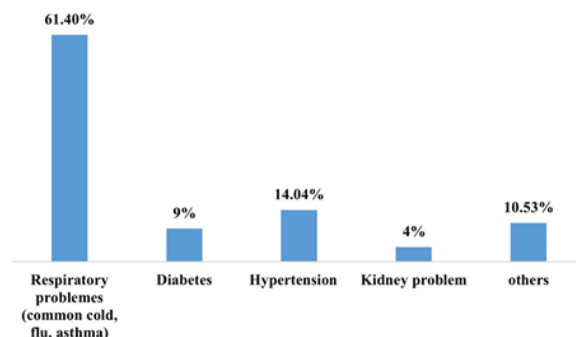


Figure 1(a) Types of health services taken through telemedicine before pandemic.

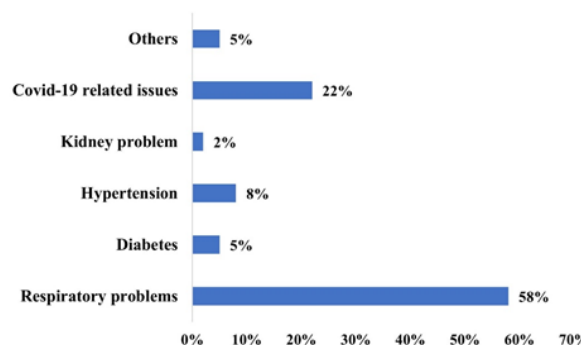


Figure 1(b) Types of health services taken through telemedicine during pandemic.

Participants responses showed that respiratory problems (colds, flu, and asthma, for example) are the most prevalent health services provided in telemedicine according to 53.50% of general people, 93.30% of respondents from pharmaceutical professional and 100% of physicians. During a pandemic, another essential health service offered in telemedicine was Covid- 19, which was claimed by the common people (18.80%), persons from pharmaceutical professional (89%) and physicians (90%). Diabetes is another form of health

treatment that is provided through telemedicine, according to general people (9%), persons from pharmaceutical professional (75%), and physicians (30%). Hypertension is also available via telemedicine, according to general people (8.20 %), pharmaceutical professional (75 %), and physicians (20%). Other health services, such as kidney problems, are also available in telemedicine, according to the general people (1 %) and people from pharmaceutical professional (61 %). All the responses are shown in Figure 2.

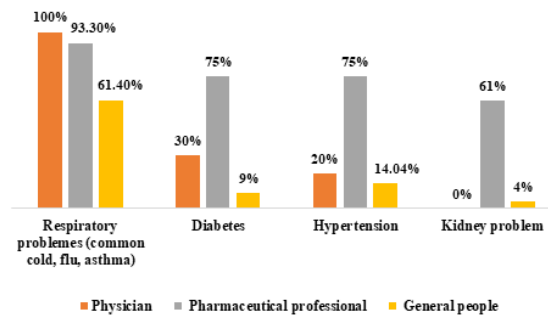


Figure 2 Treatments available via telemedicine according to stakeholders.

The statistical analysis was done to understand the comparative scenario of available health treatment in telemedicine during the pandemic. The observed z value was calculated using a Z test in statistical tool which compared with the critical value of Z. As the observed value is less than critical value, according to pharmaceutical professional, people take treatment for respiratory problem and hypertension equally. On the other hand, the comparison of the available treatment for respiratory problem with diabetes based on the value of proportion, the equality base z test was done. According

to the analysis, respiratory problem (cold, flu and asthma) is equally available with diabetes among common people as the observed value is lower than the critical value. As the observed value is less than critical value, pharmaceutical professional said that, people take treatment for respiratory problem, hypertension and diabetes almost equally. In case of physician, the treatment of respiratory problem (cold, flu & asthma etc) is equally available with diabetes because the observed z value is less than the critical z value. All of these are shown in Table 2.

Table 2 Comparative study with statistical analysis on available treatment in telemedicine

Stakeholders	Point of comparison	Z (Observed value)	Z (Critical value)
General people	Respiratory problem (Cold, flu & asthma) vs Hypertension	0.332	1.64
	Respiratory problem (Cold, flu & asthma) vs Diabetes	0.371	1.64
Pharmaceutical professional	Respiratory problem (Cold, flu & asthma) vs Hypertension	0.133	1.64
	Respiratory problem (Cold, flu & asthma) vs Diabetes	0.133	1.64
Physician	Respiratory problem (Cold, flu & asthma) vs Hypertension	0.565	1.64
	Respiratory problem (Cold, flu & asthma) vs Diabetes	0.494	1.64

About prescribed medicine through telemedicine, 100% (n=10) cold medicine is prescribed by physician through telemedicine, 80% (n=8) analgesics and 70% (n=7) antibiotics are also prescribed by

physicians. Physicians also prescribed 30% (n=3) ivermectin. Other drugs also mentioned multivitamin (40%, n=4), anti- hypertensive (30%, n=3) and ivermectin (30%, n=3). They are shown in Figure 3.

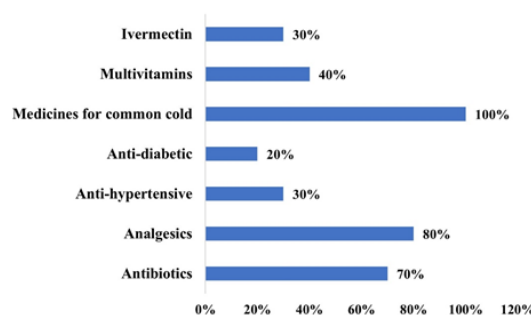


Figure 3 Types of medicines prescribed by physicians through telemedicine.

70.80 % of the general people and 90.30 % pharmaceutical professional replied that physicians are available via telemedicine during a lockdown situation. Another important reason for choosing telemedicine, according to 53.00 % of the general population and 45.20 % of pharmaceutical professional is to reduce the barrier of long distance for treatment. Doctors are present in telemedicine 24/7, according to general people (63.90 %) and pharmaceutical professional (80.60 %), which is an important reason for selecting telemedicine. Contamination was a major risk factor for covid-19 during the pandemic, therefore 82.20 % of the general people and 93.50 % of pharmaceutical professional voted for telemedicine. These are included in Figure 4. The statistical analysis was done to understand the comparative scenario of choosing telemedicine during the pandemic. According to the analysis, we can see that observed z value is lower than critical z value. As the observed

value is less than critical value, pharmaceutical professional chose telemedicine for both reasons equally. In case of physician, the available doctors in 24/7 is equally important reason for choosing telemedicine because the observed z value is less than the critical z value. On the other hand, the comparison of avoiding contamination with the reduce long distance for treatment based on the value of proportion; the equality base z test was done. According to the analysis, we can see that observed z value is lower than critical z value. So, general people choose telemedicine because of avoiding contamination which is equally important with another reason of reducing long distance for treatment in telemedicine service. In case of physician, reducing long distance for treatment is equally important reason for choosing telemedicine because the observed z value is less than the critical z value, shown in Table 3.

Table 3 Comparative study with statistical analysis on reasons for choosing telemedicine

Stakeholder	Point of comparison		Z (Observed value)	Z (Critical value)
General people	To avoid contamination	Available doctors in 24/7	0.129	1.64
	To avoid contamination	Reduce long distance for treatment	0.341	1.64
Pharmaceutical professional	To avoid contamination	Available doctors in 24/7	0.118	1.64
	To avoid contamination	Reduce long distance for treatment	0.118	1.64

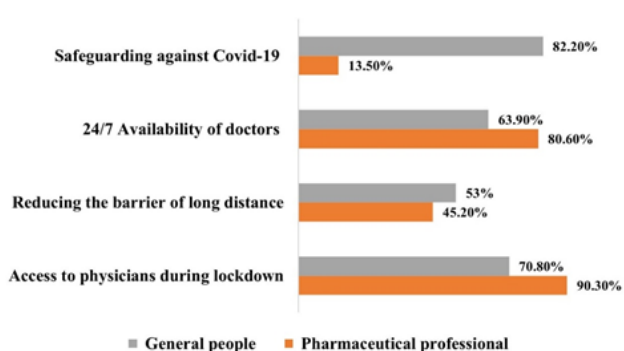


Figure 4 Reasons for choosing telemedicine during pandemic.

37.30 % of general people, 40 % of physicians, and 51.60 % of pharmaceutical professional said that it is effective during pandemic. Telemedicine is very effective, according to 37.30 % of the general people, 60 % of physicians, and 35.50 % of pharmaceutical professionals. Telemedicine is somewhat helpful during pandemics, according to 21.60 % of the general people and 9.70 % of the pharmaceutical people. However, 4% general people & 3.20% pharmaceutical professional said that telemedicine is ineffective. All these are shown in Figure 5. A Co-relational ANOVA test was done to understand the importance of telemedicine during the pandemic among different stakeholders. Since $0.248 > 0.05$, we cannot reject the null hypothesis H_0 and conclude that both stake holders gave same opinion that telemedicine is effective during the pandemic, which is shown in Table 4.

Table 4 Co-relational ANOVA test for effectiveness of telemedicine during pandemic among two stakeholders (general people & pharmaceutical professional)

ANOVA testing	Test interpretation:
Observed P value- 0.248	H_0 : The proportions are equal.
Standard Error- 0.162	H_a : At least one proportion is different from another
Alpha value- 0.05	As the computed p-value is greater than the significance level $\alpha=0.05$, one cannot reject the null hypothesis H_0
Confidence Level- 95%	

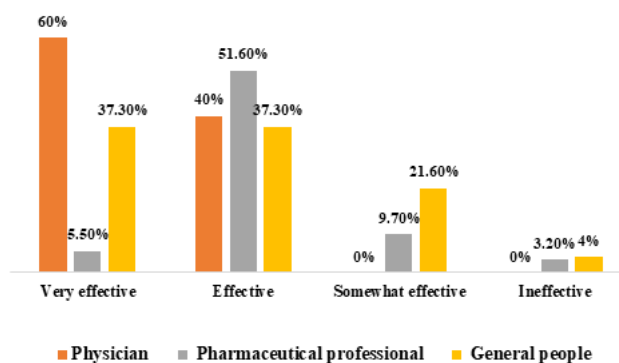


Figure 5 Effectiveness of telemedicine during pandemic.

Among the general people, 78.88% (n=127) reported that they were satisfied with telemedicine services which indicated that they want virtual care in future as well. 11.80% (n=19) also said they were very satisfied with telemedicine as well. However, 8.07% (n=13) were dissatisfied with telemedicine consultation due to occurrence of several anomalies. Physician were also asked about their satisfaction regarding patients' behavior via telemedicine service. About this, 60% (n=6) of physicians claimed they were satisfied with their patients' behavior, while 30% (n=3) indicated they were not. However, 10% (n=1) stated they were very satisfied with telemedicine service. All of their responses are shown in Figure 6(a) & Figure 6(b).

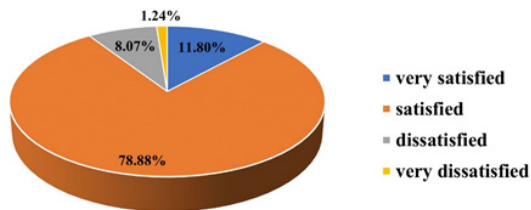


Figure 6(a) Satisfaction level of general people using telemedicine.

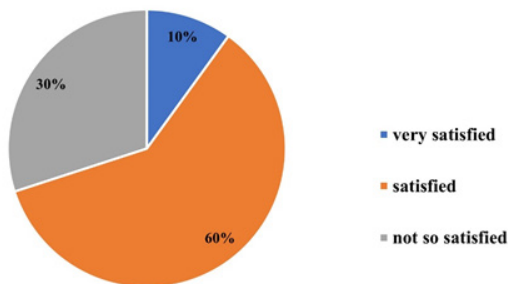


Figure 6(b) Satisfaction level of physicians regarding patients' behavior via telemedicine.

Finally, when stakeholders were asked about their opinions on the future prospect of telemedicine in Bangladesh, 80 % of physicians, 61.30% of pharmaceutical professional and 66.80 % of general people said that telemedicine should provide all health-care services. 50% of doctors, 83.90% of pharmaceutical people, and 57.10% of general people believed that telemedicine should improve security and privacy. 90% physicians, 74.20% of pharmaceutical professional and 69.30% of the common people said that the government should take the necessary steps to introduce telemedicine at all hospitals. Therefore, they concluded that telemedicine can be an effective tool of healthcare system for upcoming pandemics as well as emergency situations. The responses obtained are shown in Figure 7. A Co-relational ANOVA test was done to understand the proposed recommendation about telemedicine among stakeholders. Since $0.509 > 0.05$, we cannot reject the null hypothesis H_0 and conclude that both stake holders gave same opinion regarding recommendation about telemedicine in case of general people & pharmaceutical professional. Also, for pharmaceutical professional & physician, $0.381 > 0.05$, so we cannot reject the null hypothesis H_0 and conclude that both stake holders gave same opinion regarding recommendation about telemedicine. These are featured in Table 5.

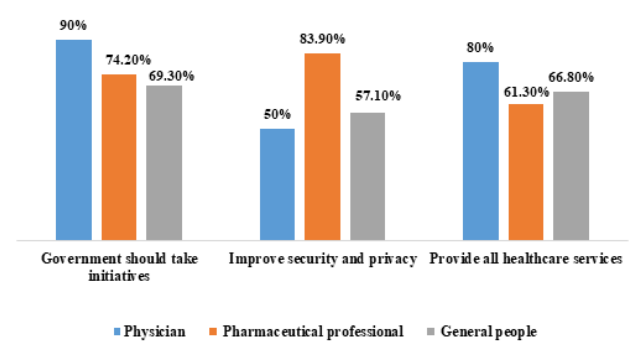


Figure 7 Recommendation regarding telemedicine among different stakeholders.

Table 5 Co-relational ANOVA test for proposed recommendation about telemedicine among stakeholders

Relationship among	ANOVA testing	Test interpretation:
General people & pharmaceutical professional	Observed P value- 0.509	H_0 : The proportions are equal.
	Standard Error- 0.407	H_a : At least one proportion is different from another
	Alpha value- 0.05	
Pharmaceutical professional & physician	Observed P value- 0.381	H_0 : The proportions are equal.
	Standard Error- 0.310	H_a : At least one proportion is different from another
	Alpha value- 0.05 Confidence Level- 95%	As the computed p-value is greater than the significance level $\alpha=0.05$, one cannot reject the null hypothesis H_0

Discussion

This study was conducted with the objective of getting an idea on the emergence as well as prevalence of telemedicine during Covid-19 pandemic in Bangladesh and its future prospect for further upcoming emergency. For this, stakeholders were questioned about what type of health services are available via telemedicine, what kind of drugs are mostly prescribed, how effective telemedicine is according to them, how much they are satisfied with the service and so on. It also focused their opinion on the emergence and usefulness of telemedicine during the pandemic, the number of people who used telemedicine before and during the epidemic, the challenges experienced when using telemedicine and recommendations for telemedicine implementation in our health-care system. Their responses showed similarities with existing studies regarding telemedicine. This study added to the small body of knowledge about telemedicine's various aspects among

common people and their satisfaction by gathering data which is similar with real-time teleconsultation data of rural Latin American settings.^{14,15} From this study, it was noted that, participants considered telemedicine to be cost-effective and the doctors noticed an increase in patient intake. Similar responses were found in another study.¹⁶ Overall, this study showed several similarities with studies published before.^{14–16} By minimizing virus dissemination, telemedicine played a significant role in Covid-19 pandemic. It is making a positive commitment to healthcare amid the widespread and is being utilized in an assortment of ways.

Keeping all these things in mind, telemedicine may be considered a viable option to face-to-face patient therapy.¹⁴ After covid-19 pandemic, its emergence is significant. During the pandemic it played an important role to prevent the spread of coronavirus. We should take more initiatives to implement telemedicine for our future health sector. Stakeholders responded that the government could play a vital role in this regard. They also emphasized on increasing available healthcare services through it as well as making people aware of its significance. Due to strict social distance and various government regulations for patient management and care, telemedicine was largely accepted throughout the COVID-19 pandemic. According to other studies, there has been an increase in the use of telemedicine due to strict social distance during the pandemic. Clinicians will utilize telemedicine after the epidemic, according to an analytical data.¹³ All these are evident that telemedicine isn't a new idea. However, in our health-care system, telemedicine should be implemented more for future emergencies.

Conclusion

This research represented a thorough overview of telemedicine services during the covid-19 pandemic and its future possibilities in this country. During the Covid-19 outbreak, 82.20% of common people used telemedicine as their first line of defense to keep the virus away from spreading for light treatment. Co-relational ANOVA test represented equal response of the stakeholders to validate the effectiveness of telemedicine during pandemic. Among all the respondents 50.23% people took benefit from the telemedicine service in Bangladesh. Therefore, it can be said that telemedicine can be a vital alternative for conventional healthcare services during epidemic and pandemic situations if people from all sectors come forward to make it happen.

Acknowledgments

The authors are grateful to Department of Pharmaceutical Technology, University of Dhaka for their support in conduction of the research work.

Conflict of interest

The authors declare no conflicts of interest.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

1. Liu Q, Xu K, Wang X, et al. From SARS to COVID-19: What lessons have we learned? *J Infect Public Health*. 2020;13(11):1611–1618.
2. Anthony Jnr B. Use of telemedicine and virtual care for remote treatment in response to COVID-19 pandemic. *J Med Syst*. 2020;44(7):132.
3. Perrone G, Zerbo S, Bilotta C, et al. Telemedicine during Covid-19 pandemic: advantage or critical issue? *Med Leg J*. 2020;88(2):76–77.
4. Azer SA. COVID-19: pathophysiology, diagnosis, complications and investigational therapeutics. *New Microbes New Infect*. 2020;37:100738.
5. Cascella M, Rajnik M, Aleem A, et al. Features, evaluation, and treatment of coronavirus (COVID-19). 2023.
6. Wiersinga W, Rhodes A, Cheng A, et al. Pathophysiology, transmission, diagnosis, and treatment of coronavirus disease 2019 (COVID-19): A review. *JAMA*. 2020;324(8):782–793.
7. Hong Z, Li N, Li D, et al. Telemedicine during the covid-19 pandemic: experiences from Western China. *J Med Internet Res*. 2020;22(5):e19577.
8. Chowdhury SR, Sunna TC, Ahmed S. Telemedicine is an important aspect of healthcare services amid COVID-19 outbreak: Its barriers in Bangladesh and strategies to overcome. *Int J Health Plann Manage*. 2021;36(1):4–12.
9. Islam, Begum R, Ali S. Chapter XXXII *Trends and Prospects of Telemedicine*. IRMA. 2009.
10. Nessa A, Ameen M, Ullah S, et al. Applicability of telemedicine in Bangladesh: current status and future prospects. *The International Arab Journal of Information Technology*. 2010;7(2).
11. Abo-Zahhad M, Ahmed S, Elnahas O. A wireless emergency telemedicine system for patients monitoring and diagnosis. *Int J Telemed Appl*. 2014;2014:380787.
12. Mullick AR, Rayhan N, Koly KN, et al. Telemedicine and telehealth: a virtual care platform with prospects & importance during covid-19 outbreak. *European Journal of Pharmaceutical and Medical Research*. 2020;7(8):39–40.
13. Agrawal PK, Pursnani N, Singh AP, et al. Comprehending telemedicine: an online survey amidst COVID-19 pandemic. *J South Asian Feder Obst Gynae*. 2020;12(6):345–347.
14. Acharya RV, Rai JJ. Evaluation of patient and doctor perception toward the use of telemedicine in Apollo Tele Health Services, India. *J Family Med Prim Care*. 2016;5(4):798–803.
15. Orrange S, Patel A, Mack W, et al. Patient satisfaction and trust in telemedicine during the COVID-19 pandemic: retrospective observational study. *JMIR Hum Factors*. 2021;8(2):e28589.
16. López C, Valenzuela J, Calderón J, et al. A telephone survey of patient satisfaction with realtime telemedicine in a rural community in Colombia. *J Telemed Telecare*. 2010;17(2):83–87.