Assessing Electronic Health Service of Bangladesh Government during COVID 19: A Cross-Sectional Mixed Method Survey

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***Abstract*: The influx of COVID 19 has exposed the vulnerability of the health sector in both developing and developed countries. So, it has been crucial to assess the e-health service of the Bangladesh government during COVID 19. A cross-sectional mixed method survey was conducted where 150 participants took part in a closed-ended questionnaire survey and 10 participants were involved in a semi-structured interview. Participants are selected from urban (72%) and rural (28%) areas purposively who availed of e-health services during COVID 19. The study used SPSS version 25 to analyze quantitative data using descriptive statistics, frequency, mean, standard deviation, and variance. The result of the study exposed that the existing status of electronic health services in Bangladesh is not satisfactory yet. Most of the people (91.3%) accessed online vaccine registration services only. Due to the lack of information, participants are not availing rest of the e-health services of the government like telemedicine, COVID test report download, live corona test, and use of corona tracer app/ surokkha app. As a result, only 5.76% of participants are highly satisfied with the government e-health service during the pandemic. 56.88% responded that government had high-level challenges to promote electronic health services during COVID 19. The major challenges are lack of available e-health service information, awareness raising, and low level of internet speed. So, the study recommends bridging the digital divide between urban & rural areas along with ensuing more IT facilities in government health services.**

***Keywords*: Electronic Health Service, COVID 19, Bangladesh.**

I. INTRODUCTION

COVID 19 has been a major concern for the physical and mental health of people all over the world (Kontoangelos et al., 2020). It is caused by SARS-CoV-2 which has some common symptoms like fever, cold, cough, etc. At the beginning time of COVID 19, it was thought that COVID 19 was spread through zoonotic interaction. But the world experienced that this virus had spread through human-to-human and animal interaction (Huang et al., 2020). On 30th January 2020, the World Health Organization (WHO) declared COVID 19 a public health emergency of international concern (WHO, 2020). Bangladesh declared COVID 19 the pandemic in 2020 by warning people to maintain COVID protocols, social distancing, staying at home, hand washing, and mandatory mask-wearing in public places (Flexman et al., 2020; The Government of Bangladesh, 2020).

COVID 19 exposed the vulnerability of health care facilities in less developing countries due to massive corruption which sternly impacted public health service delivery (Al-Zaman, 2020). Bangladesh is one of those countries that are submerged by a series of challenges in delivering quality health services (Chowdhury, 2020). The health care facilities of Bangladesh are multifaceted with a lack of reliability and responsiveness that affect public health facilities. Besides, there is a huge gap in the availability of medicines between the urban and rural areas (Mohiuddin 2019). The Bangladesh government has been suffering three major challenges in health sectors that include a weak governance system, a lack of available healthcare facilities, and poor communication mechanisms in public health (Al-Zaman, 2020).

On 8th March 2020, the COVID 19 case was confirmed in Bangladesh and after that more than 0.63 million overseas workers entered without proper scanning (Julqarnine et al., 2020). The government declared a general holiday for ten days from 26th March to 4th April 2020 without restricting public movement on public transport. After receiving this notice, more than 12 million people left Dhaka very hurriedly, which significantly accelerated community transmission (New Age, 2020). Bangladesh experienced a limited number of testing kits, few testing laboratories, a high price of COVID tests in private hospitals, and a lack of expert health workers. Mass people did not get their priority while accessing health services during the pandemic whereas elite class and political leaders got extra privilege. As a result, the COVID test rate was very low (0.34%) and Bangladesh ranked 2nd lowest country in the South Asian region. Thus, on the eve of the onset of COVID 19, public health was under threat due to a lack of government action (Pattanaik, 2020; Julqarnine et al., 2020).

The health sector of Bangladesh includes hospitals, clinics, diagnostic centers, telemedicine, and so on. In 2018, the size of Bangladesh's healthcare industry reached $ 6.76 billion in

terms of expenditure. As per the enlisted registration of the Directorate General of Health Services, Bangladesh has 255 public hospitals, 55504 private hospitals & clinics, and 9529 diagnostic centers (BIDA, 2021). The health sector of the Bangladesh government includes medical colleges, various specialized hospitals, district hospitals, general hospitals, Upazila health complex, maternal & child welfare center, union sub-centers, union health & family welfare center, community clinic, etc. The Ministry of Health & Family Welfare, Ministry of Local Government, Rural Development & Cooperatives, and Directorate General of Health Services regulate and supervise public sector health facilities in Bangladesh (Sattar, 2021). E-health and m-health programs are run by the Bangladesh government with the assistance of NGOs, Donors, etc. Besides, many programs are also implemented through the public-private partnership model. From the government budget, the health sector receives a large amount to expedite e-health services (Ahmed et al., 2014).

E-health offers various ICT-based services for citizens which can help eliminate the hassle to access health facilities. In this context, it is important to understand the existing electronic health service scenario in Bangladesh. So, the paper aims to study assessing the electronic health service of the Bangladesh government during COVID 19 pandemic. The paper also focused on measuring people's satisfaction regarding available electronic health services during the pandemic. Furthermore, it has also analyzed the potential and major challenges of providing electronic health services by the government.

II. METHODOLOGY

The study followed mixed methods of a cross-sectional survey which includes qualitative and quantitative approaches. The mixed method study was chosen to assess the existing status of electronic health services of the government of Bangladesh during COVID 19 pandemic. In this study, the qualitative investigation helped to get in-depth information regarding existing e-health services of government, the satisfaction of the participants, potentials, and challenges in e-health service. The quantitative investigation was required to yield numerical values for assessing e-health services.

This cross-sectional survey was conducted from 1st September to 1st November 2021. The respondents aged 18 years and above belonged to urban & rural areas of Bangladesh from the diversified occupation of the society. The study followed multi-stage sampling, purposive sampling, and simple random sampling. It purposively shortlisted those participants who availed of electronic health services of the government during the COVID 19 pandemic. The study randomly selected 150 participants for the closed-ended survey questionnaire. The questionnaire was prepared in a word file and responses were received through email, Facebook, WhatsApp, and a face-to-face interview. The study also took 10 respondents for a semi-structured interview. The interview was conducted physically with maintaining social distance. The study also applied telephone interviews having a duration of 20-25 minutes.

The primary data was collected through a survey questionnaire and semi-structured interviews. The secondary data includes journals, articles, government reports, websites, news reports, etc. For quantitative analysis, the study used the Statistical Packages for Social Sciences (version 25) to analyze the data using descriptive statistics, frequency, mean, standard deviation, and variance.

The study received permission from the Center for Higher Studies & Research (CHSR), Bangladesh University of Professionals (BUP) to use the data from BUP research project 2020-2021. All the responses were recorded with the consent of all the participants. The study-maintained confidentiality and privacy of the participants strictly. However, a semi-structured interview was conducted on the self-financing of the authors. Participants willingly participated in the interview and gave their responses accordingly.

III. LITERATURE REVIEW

ICT significantly contributed to accelerating health services all over the world. In developing countries, the health sector experienced a glimpse of information and communication technology in the past decade (Alvarez, 2002; Sharifi et al., 2013). Like other countries, Bangladesh took the initiative to promote ICT in health service delivery (Haque et al., 2014). The first e-health initiative was taken in 1998 by the Ministry of Health & Family Welfare (MOH&FW) with 'Health & Population Sector Programs' (HPSP). In this program, special emphasis was given to introducing the use of ICT in health services for the citizens. At that time, both the public and private hospitals took a series of initiatives for promoting e-health programs (Ministry of Health & Family Welfare & World Bank, 2003). Bangladesh government adopted HPNSDP (Health, Population and Nutrition Sector Development Program) for the Ministry of Health & Family Welfare. The HPNSDP continued between 2011-2016 and had 32 operational goals among which e-health was one of the important agendas (Ministry of Health & Family Welfare, 2016).

Hossain et al. (2022) highlight on security issues of e-health services in the context of Bangladesh. The study argued that telemedicine services started in Bangladesh aiming at ensuring health services for unprivileged communities in rural areas. The result shows that there has not been created adequate awareness among the rural population in Bangladesh. Due to this, telemedicine service has not benefitted rural people progressively.

Sadrul & Noushin (2021) showed that Bangladesh experienced immense progress in the health sector in recent times, especially in immunization programs and life expectancy. But there are still lots of areas where government needs to intervene to eliminate the disparity between urban and rural areas to accelerate health service delivery. Most of the facilities with specialized doctors are available in the urban areas but rural people hardly have this kind of

opportunity. In that case, telemedicine plays a key role to minimize the gap by enabling both urban and rural people to avail health services instantaneously.

Chowdhury et al. (2021) studied healthcare services in Bangladesh during COVID 19 with a special focus on telemedicine. The study found some barriers to the existing telemedicine services that are a lack of available ICT facilities, infrastructural support, trust in patients, and digital security. So, the study recommended ensuring adequate support to ICT facilities, infrastructural development, creating trust in patients, and adopting a telemedicine policy.

Abedin et al. (2021) studied adults from various regions of Bangladesh who are willing to receive the COVID 19 vaccine. The study finds that most adults (74.6%) are willing to get the COVID 19 vaccine free of cost and 46.5% are expected to get the vaccine with a minimum fee. The hesitation against COVID 19 mostly belongs to the elder population, day laborers, and less educated people. Most of the rural, semi-urban, and slum-dwellers have a very low level of confidence in the existing healthcare system of Bangladesh. So, the study recommended keeping the vaccination program free of cost for people. Government, NGOs, and health workers should work to motivate rural people for pursuing COVID 19 vaccine.

Rahman et al. (2022) studied university students' knowledge, attitude, and hesitancy on COVID 19 vaccination. The study found that students mostly collected COVID-related information from electronic and social media. 64.81% of students have a good attitude toward the COVID 19 vaccination program of the Bangladesh government. Even, 54.34% of students believed that COVID 19 vaccine was safe and secure for human health. The findings presented a very low level of the hesitancy of university students to receive COVID 19 vaccine. But some students fear that there might have been side effects of the COVID 19 vaccine.

Al-Zaman (2020) describes the crisis in the health care system in Bangladesh during COVID 19 pandemic. The study found three major challenges deepening the health crisis in Bangladesh. The existence of a weak governance system is liable to undermine health services in Bangladesh which leads to giving space for extensive corruption. The existing facilities are not sufficient for service delivery in healthcare. The network system of healthcare is very ineffectual resulting in developing poor communication in the health system. So, it is highly required to intervene in governance issues, health facilities, and health communication systems.

Most of the studies focused on m-health, COVID 19 vaccination program, people's knowledge, attitudes regarding COVID 19 vaccines, and the health sector crisis. Some studies highlighted barriers and challenges of e-health services in Bangladesh. However, there is found a research gap studying assessing electronic health services of the Bangladesh government during COVID 19. As the government had a huge investment to accelerate e-health services, so it is required to assess e-health services during COVID 19 including people's satisfaction, potential, and challenges.

IV. RESULTS AND FINDINGS

Socio-Economic Profile of the participants

The table 1 and 2 present the socio-economic profile and descriptive statistics of the participants who availed of electronic health services of the government during the COVID 19 pandemic. The eligibility of participants is aged 18 years old and above. The variance (σ^2) value of living areas is 1887.500 where 28% of participants belong to rural areas and 72% of urban areas of Bangladesh. The mean ($\bar{x}$) and standard deviation (σ) values of sex are 1.40 and .492 among which 60% were male and 40% were female.

Table 1 Demographic Information of the Participants

Living Area				
	Frequency	Percent	Valid Percent	Cumulative Percent
Rural	42	28.0	28.0	28.0
Urban	108	72.0	72.0	100.0
Total	150	100.0	100.0	
Sex				
Male	90	60.0	60.0	60.0
Female	60	40.0	40.0	100.0
Total	150	100.0	100.0	
Education				
Able to Sign	1	.7	.7	.7
Primary Level	6	4.0	4.0	4.7
JSC	6	4.0	4.0	8.7
SSC	7	4.7	4.7	13.3
HSC	20	13.3	13.3	26.7
Bachelor and Above	110	73.3	73.3	100.0
Total	150	100.0	100.0	

Table 2 Descriptive Statistics of the Participants

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
ID	150	1	150	75.50	43.445	1887.500
Living Area	150	1	2	1.72	.451	.203
Sex	150	1	2	1.40	.492	.242
Marital Status	150	1	4	1.78	.554	.307
Religion	150	1	3	1.07	.349	.122
Valid N (listwise)	150					

Available E-health services and the response of recipients

During COVID 19 pandemic, the government of Bangladesh provided various kinds of electronic health services for the people. The study selected major five electronic health services provided by the government. The services include telemedicine dialing 16263, online vaccine registration, downloading COVID test report, live corona test from the

website, and use of the corona tracer/ surokkha app. Table 3 presents descriptive statistics of the existing electronic health services of the government of Bangladesh during the COVID 19 pandemic.

Table 3 Descriptive Statistics of Existing e-health service

	N	Yes%	No %	Sum	Mean ($\overline{x}$)	Std. Deviation (σ)	Variance ($\sigma^{2)}$)
Telemedicine	150	35.3	64.7	247.00	1.6467	.47961	.230
Online Vaccine Registration	150	91.3	8.7	163.00	1.0867	.28229	.080
COVID Test Report Download	150	30.0	70.0	255.00	1.7000	.45979	.211
Live Corona Test	150	10.7	89.3	284.00	1.8933	.30972	.096
Corona Tracer/ Surokkha App	150	23.3	76.7	265.00	1.7667	.42437	.180
All the above	150	5.3	94.7	292.00	1.9467	.22545	.051
Others	150	--	100	300.00	2.0000	.00000	.000
Not at all	150	--	100	300.00	2.0000	.00000	.000
Valid N (listwise)	150						

The mean (1.0867) and St. deviation (.28229) value of online vaccine registration describes that most of the participants (91.3%) availed of vaccine registration during the pandemic. 35.3% availed telemedicine and 30% downloaded COVID test reports from the website. The descriptive

statistics of table 3 show that the St. deviation (σ) of the live corona test is .30972 and the corona tracer app/surokkha app is .42437. The data shows that only 10.7% accessed the live corona test from https://livecoronatest.com/ and 23.3% used the corona tracer app/surokkha app. Among all the participants, only 5% ($\overline{x}$=1.9467, σ=.22545, σ^2= .051) availed of above mentioned electronic health services during COVID 19. From the descriptive statistics, it is evident that the government facilitated online vaccine registration, telemedicine, and COVID test download service.

During the interview, one of the respondents opined that-

> During COVID 19 pandemic, I tried to get health suggestions regarding COVID 19 precautions by dialing 16263. But I frequently found the number busy and could not avail the service. Due to a lack of internet speed, I failed to download COVID 19 test report. I went to the local cyber cafe and then I got my report. Though I made vaccine registration sitting at home, I faced problems while downloading my vaccine certificate.

Another interviewee shared his experience in the following way-

> I have no literacy on how to avail of services by accessing apps and government websites. When vaccination started all over Bangladesh, there was no available information in rural areas from the government on how to register for COVID 19 vaccination service. Even, I waited for whether the government provided support for registration for illiterate people. Finally, I

attended COVID 19 mass vaccination program in my area and got the vaccine but received the certificate lately.

Satisfaction regarding e-health service of the government

Figure 1 shows the level of satisfaction of the participants who availed of electronic health services of the government during COVID 19.
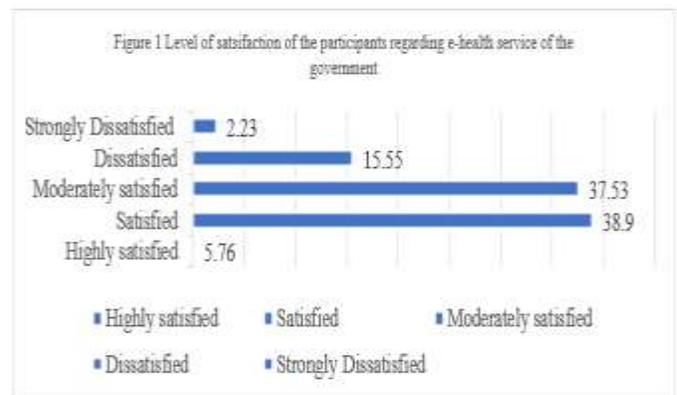
Among 150 participants, only 5.76% are highly satisfied, 38.9% are satisfied, and 37.53% are moderately satisfied with the e-health service of the government during COVID 19. One of the respondents explained that-

> During COVID 19, I accessed government websites to get an update on COVID 19. I knew about telemedicine services and COVID 19 vaccination service. This kind of initiative was very helpful for getting COVID health information. After calling 16263, Doctor immediately responded and sent medicines or suggestions vis SMS to the phone number. Even, He recorded all the information about me and gave me lots of health advice on how I can make myself safe from coronavirus.

On the other hand, 15.55% are dissatisfied and 2.23% are very dissatisfied with the e-health service of the government. Because the government did not circulate all the electronic health service information for urban and rural people. One of the respondents explained why he is dissatisfied with e-health services during the pandemic.

> I think the government has not too concerned about promoting health issues during pandemics. Yes... The government took initiatives to promote vaccination and COVID test download service. But, government advertisement was minimal to accelerate access to information for all people. Even, the government did not engage local leaders and socially influential & notable community people to promote e-health services of the government. So, all the decisions made centrally and rural people did not get COVID-related information timely.

Challenges in providing e-health service

Table 4 shows participants' responses regarding various challenges (on the scale of high, medium, and low) of the government to widening e-health services of the government in Bangladesh.

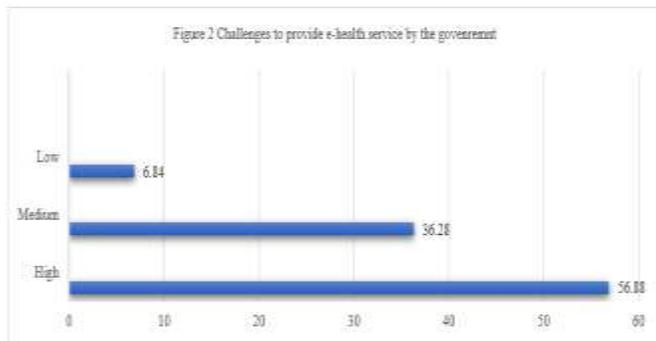Figure 2 Challenges to provide e-health service by the government

Figure 2 shows that 56.88% of participants say that government has a high level of challenges to provide e-health services during COVID 19. 36.38% responded that governments have medium-level challenges of government to deliver e-health services.

During the interview, one interviewee explained that-

> The government hardly disseminated information on how people could easily access e-health services. They gave instructions for lockdown, mandated mask-wearing, social distancing, and control of public movement. But people were not ready to accept the government order. The government failed to create awareness among the mass people. As local leaders were not included in the policy decision, it was not possible to ensure a quick response from the participants of the e-health service.

Another interviewee argued that-

> Due to excessive pressure, people were unwilling to make online registration for the COVID vaccination service. Initially, only NID card holders were allowed to apply for COVID vaccine registration which discouraged many people to take part in the service. In my registered center,

the vaccine was finished and I got my 2nd dose 4/5 months later. When my family members became COVID affected, I tried several times to download their test reports.

In contrast, the rest of 6.84% says that government has low-level challenges to deliver e-health service during the pandemic. One participant clarified his position-

> Of course, the government had the bitter experience to manage the pandemic situation but over time they managed COVID testing kit and vaccination for both urban & rural people of Bangladesh. The government continuously warned people through miking, advertising on television, social media, and television. Generally, people have the inertia to adapt to change initiatives and welcome them cordially. I knew how to access the government website and received updated information regarding COVID 19 which made me aware of keeping protected from coronavirus.

Potentials of electronic health service during COVID 19

The government of Bangladesh has a target to accelerate IT in health service delivery (Ministry of Health & Family Welfare, 2012). The government of Bangladesh has indeed given serious attention to adopting a digital health strategy in Bangladesh. On December 22, 2020, the Directorate General of Health Services (DGHS) organized one day workshop to confirm the draft of the digital health strategy (WHO, 2021). So, it is important to know whether the government of Bangladesh has the potential to promote electronic health services. During the interview, one of the respondents opined that-

> I think that the Government of Bangladesh has a visionary plan to achieve its targets. As the government ensured 100% electricity all over Bangladesh, it is nowadays possible to widen internet access in the rural corner of Bangladesh. As COVID emerged as a pandemic within a very short time, the government took time to adjust. The government of Bangladesh declared response strategies on how to cope with the pandemic. Under the national response, various committees were formed at the district, upazila, municipality, and city corporation levels to prevent COVID 19.

In contrast, another interviewee explained that-

> The government does not have prospects to promote electronic health services in Bangladesh. We saw evidence that rampant corruption happened in the health sector of Bangladesh. During COVID 19 pandemic, many incidents occur in the areas of buying the N 95 mask, false information in the COVID test report, etc. These incidents have raised questions in the public mind about how the government will be continuing to promote e-health services for the people.

As the wave of COVID 19 is not over yet, the government must enhance its capacity to provide online health services for people. One of the respondents shared his perception saying that-

> I think that Bangladesh is one of the hard-hit COVID 19 affected countries in the world. Despite the bitter experience of the COVID situation, our government did not increase the expenditure on health in the national budget. This raises the question in the public mind to what extent the government is willing to promote the digitalization of health services. Yes…. urban people are indeed getting electronic health services by various means. But very little government action can be seen to provide online health services of the government among the village people.

V. DISCUSSION

The study has set a key objective to assess the electronic health service of the Bangladesh government among the urban and rural populations. The results show that people availed in telemedicine (35.3%), online vaccine program (91.3%), and COVID test report downloading (30%). However, 64.7% of participants did not avail of telemedicine service during COVID 19 and 70% could not download the COIVD test report. Except for the vaccine program, no other service received more than 50 percent of the population. Though mass people (91.3%) participated predominantly in the online vaccine registration program, it was not easier to connect with rural community people. Hossain et al. (2021) showed a similar kind of result that the online vaccine registration process is not an easy one for all people due to the existence of the digital divide in Bangladesh. There is a structural barrier that affects the operation of online registration for the COVID vaccine. So, this study recommended revising the online COVID 19 vaccine registration policy of the government. Mahmud et al. (2021) show that most of the respondents (61.16%) are willing to get COVID 19 vaccine and 35.14% have interested to receive the vaccine immediately.

During the interview, respondents admitted that they had a lack of information regarding COVID 19 vaccine registration on the online platform. This is similar to the study of Islam et al. (2021) which describes a low level of adequate knowledge of the people regarding the COVID 19 vaccine. The interview data shows that the poor internet connection has affected the online vaccine registration program of the Bangladesh government. This result is similar to the context of Bangladesh and Ghana reported in the study of Tagoe et al. (2021). They showed that the existence of poor internet connectivity hindered COVID 19 vaccination program. The survey results exposed that 5.76% of participants are highly satisfied and 38.9% are satisfied. In means that several people are dissatisfied (15.55%) and strongly dissatisfied (2.23%) regarding electronic health services of the government during COVID 19. The study of Parvez et al. (2021) showed a similar result that participants were not satisfied with healthcare services during COVID 19 in Bangladesh.

Findings show that 56.88% perceived high and 36.38% perceived low levels of challenges for the government in delivering electronic health services in Bangladesh. The major challenges include a lack of awareness raising in rural areas, available information on e-health services, and low-level internet speed. Similar kinds of challenges were identified in various studies in the global context like lack of awareness of e-health services (Chowdhury et al. 2020), lack of internet service with high-speed internet (Webber et al. 2022), and lack of available information to the users (Baixinho et al. 2021).

VI. CONCLUSION

Bangladesh government acclaimed internet connectivity in all health centers at the Upazila level and now it extended to Union Health & Family Welfare Centers (UH&FWC) and Community Clinics. Thus, m-health got immense response among the rural community. By 2009, the government planned to install an MIS system that guaranteed internet connectivity in all hospitals at the national and sub-national levels. As a result, m-health and video conferencing became popular means of health service for citizens (DGHS, 2009; Hoque et al., 2014). However, COVID 19 has severely impacted the health sector in the context of Bangladesh. The overall assessment of electronic health service delivery is not so effective. Participants accessed only a few e-health services during the pandemic. The government of Bangladesh was multifaceted with a myriad of challenges like lack of information, proper advertisements, and poor network connection. Despite the good achievement of the government in public health, COVID 19 has unlocked the inner strengths of the health system in Bangladesh. As a result, people's satisfaction regarding e-health services is not yielding at a higher rate. So, it is high time to ease e-health service by ensuring access to information, sharing information with mass people, and providing high internet facilities in both urban and rural areas of Bangladesh.

VII. RECOMMENDATION AND POLICY IMPLICATIONS

From the above findings, the study recommends using social media, print & electronic media for promoting electronic services during any emergencies. As the government failed to promote e-health services among urban and rural people of Bangladesh, it is highly required to establish a strong online platform for the government (website, social media for campaign purposes). Due to lack of information, people do not access government portals for getting government messages regarding COVID health protocol and safety measures. Rural people hardly have orientation regarding electronic health services. So, the government should adopt a strategy to promote the e-literacy of the population, especially in rural households of Bangladesh. In Bangladesh, people are not enabling the fastest electronic health services due to a lack of internet speed which forced people to avail high-cost health

services from private hospitals and clinics. So, the government needs to accelerate internet speed to boost e-health service delivery of the government. However, the study has acclaimed some policy implications based on the findings of the study:

- The findings of the study have direct implications for the ongoing 8th five-year plan of the Bangladesh Government (2021-2025). The study urged the promotion of e-health services in urban and rural populations of Bangladesh. The government has set a goal in the health sector which describes ensuring quality health services for the people with the use of IT in health facilities (Planning Commission, 2020, p.583-586).
- It has also practical implications for Sustainable Development Goals, specifically SDG goal (3) which states 'Good Health and Well-Being'. It demands efficient allocation of funding in the health sector, improving sanitation systems, and health hygiene (United Nations, 2022). So, the government needs to ponder over how efficiently health services can be offered for all whereas electronic health can intervene by bridging the service delivery gap between urban and rural areas of Bangladesh.
- As people are bound to avail online vaccine registration services during pandemics, they are involved in the particular e-health service. But people in most cases have not turned to electronic services to get health facilities. So, it is required to give high attention to how to facilitate electronic health for urban and rural people. The findings have policy implications for the National Health Policy-2011 of the government of Bangladesh. However, the health policy has set a target which is to ensure optimal use of information technology in the overall management of the health sector including health services (Ministry of Health & Family Welfare, 2012).

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