Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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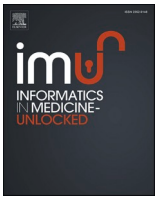

Consumer side economic perception of telemedicine during COVID-19 era: A survey on Bangladesh's perspective

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ABSTRACT

In Bangladesh, the telemedicine industry is one of the few industries able to flourish in the contemporary era of COVID-19. But to thrive, the industry must know the viewpoints of both consumers (those who are interested in availing the services of the industry) and non-consumers to overcome deficits. This should be done to maximize profits and give optimal utility to users so that the industry can be made sustainable in the long run. The main aim of this paper is to analyze the economic perception of both the telemedicine consumers and non-consumers of Bangladesh and the actions required to be taken to optimize them. A survey was developed with 18 questions divided into several parts relating to the health identity of the respondent, the respondents' use of telemedicine, the analysis of the economic behaviors of the respondents with regards to telemedicine, and the consumer perception of the merits and demerits of telemedicine. The survey results show that about one-third has used some form of telemedicine during the COVID-19 pandemic. Among the telemedicine users, 48% used hospital-mandated telemedicine services whereas 41% used mobile telemedicine applications. The survey states that 75% were satisfied with the service they received. The average payment made by the respondent population was 532 Taka, and 62% of them thought that the amount they paid was justified. In conclusion, the results of this survey can be utilized in making economically viable telemedicine models that will give optimal utility to its consumers and help forecast the next stage of the industry for betterment in the health sector.

1. Introduction

In an era of ever-changing technological advancements and a sharp rise in internet penetration throughout the world, many things have become remote/online to a certain extent. Healthcare isn't an exception to this. Healthcare and medicinal aid can nowadays be availed online in the form of telemedicine and telehealth. Telehealth can be thought of as disseminating health-related data and services through the utilization of electronic advancement and telecommunication technology that allows long-distance patient and clinician/physician contact [1].

Due to the rise of the COVID-19 pandemic, many things have gone through a revolution. This revolution is an increasing shift from the usage of in-person methodologies to online systems. Shopping, ride-sharing, health, and even education have all gone through this stage. Many of these sectors have many studies to find out their optimized usage. For example, in the education sector, there's been thorough research on the best practices regarding classroom efficiency concerning architecture, configuration, accuracy, and other details to optimize learning management [2].

Even before the advent of COVID-19, the global telemedicine outlook had unprecedented levels of growth. There were several factors, some of which were: the need to reduce the cost of healthcare (telehealth reduces or eliminates this by providing remote healthcare and checkup), the approval of remote healthcare services by federal regulatory agencies (such as the FDA in the USA) which led to a sense of security for most who would wish to vouch for it, the improvement of patient and system engagement (through chatbots, better website user interface or even AI) and a rising elderly population who required another way of diagnosis [3]. In financial terms, according to a market report by Grand View Research on several telemedicine enterprises in different parts of the world, an exponential rise of 35% has been experienced from 2019 to 2020 due to the onset of the pandemic. If given this tremendous growth rate of the industry, the report forecasted that revenue would reach about $300 billion [4]. Interestingly, even before COVID-19, telehealth was still expected to grow from $11.6 billion in 2011 to $27.3 billion in 2016 [5].

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The year 2019 saw the rise of the COVID-19 pandemic, which took the entire world by storm and has so far taken the lives of over 2 and a half million people [6]. What truly makes the virus terrifying is that it spreads from one person to another through the respiratory tract after someone carrying the virus coughs, sneezes, talks, or even breathes [7]. Since close contact was challenging to manage, telemedicine paved the way. For example, the Blue Cross Blue Shield Association (BCBSA) in the USA has leaned onto telehealth strategies to combat the spread of the virus, supplying services such as prescriptions [8].

Bangladesh is also beginning to take steps in telemedicine services. Since the country is low on physicians, mainly rural, telehealth can alleviate the situation [9,10]. In Bangladesh, the era of COVID-19 proved that telemedicine has to become an indispensable part of contemporary healthcare. Many doctors are now providing consultations to their patients through video-conferencing, which has become immensely popular since March 2020 because human contact wasn't allowed. HelloDoc, Daktarbhai, Praava Health were a few telehealth services that rose in prominence [11].

The rise of internet penetration in Bangladesh has brought a rapid rise that promoted a new era in online economics. Telehealth is 3rd in the list of most preferred investment segments in the country, with preference from 67% of investors, meaning that it has a bright economic future in Bangladesh [12]. Now, anticipating how telemedicine can affect health analysis and the economics of a nation, the government, international organizations such as the World Health Organization (WHO) and Directorate General of Health Services (DGHS), and several private start-ups and companies are beginning to take hold [13]. Also, there is growing interest in using online platforms and other social media sites regarding consumer needs and perceptions. According to UNB (United Nations Bangladesh), a large part of the ailing population retrieved healthcare services through physical platforms (such as telephones and mobile phones) and online media (Facebook pages, web pages, online applications, and Skype) [14]. But the path is a rocky one for which telemedicine and national economics need to go hand in hand for the betterment of society.

The pandemic has so far had a devastating effect on the economics of various sectors in different parts of the world. In a survey of 5800 small businesses in the USA conducted by Bartik et al., it was found that 43% of the companies had temporarily shut down, and employment had fallen by 40%. About 38% of the respondents had deemed it unlikely or somewhat likely that the business would bounce back at the end of 2020 [15]. From the perspective of the EU economies, some industries performed relatively well in the pandemic (such as the digital and healthcare industries). In contrast, some, such as the chemical and construction sectors, are expected to experience a recovery. But industries dependent on human contact and interaction, such as the cultural and creative industries and the aerospace industry, have been struck terribly and are expected to suffer for a prolonged period [16].

The healthcare of Bangladesh is also in a very fragile state in this era of the COVID-19 pandemic due to many underlying reasons [17]:

- mismanagement in the health sector due to immense amount of corruption
- counterfeit budget allocation in medical equipment and health service
- fake COVID-19 test certificates, distribution of incorrect results of COVID-19 results
- very low testing rate at its initial stage (about only 0.34%) due to limited number of testing laboratories and kits
- fewer number of medical services which are also heavily mismanaged and biased towards certain parts of the population
- and a very large physician to patient ratio (only 3.05 physicians and 1.07 nurses serve every 10,000 people on average).

The various causes of mismanagement in healthcare and the fact that the pandemic prevents people from coming together have caused several online healthcare services (telemedicine services) to develop around the country. According to Access to Information (A2I), about 15 digital healthcare services provide health services around the country. Many doctors have shifted to online video consultations to cope with the rising numbers of patients [11]. A report revealed that 79% of patients stay at home and get treatment over the phone [17].

As the idea of telemedicine is gaining ground and its development is accelerating, the economics behind it requires consideration. The needs of the consumer can tell us to a certain degree the decisions required. From the perspective of telehealth, we can consider a consumer to be someone who uses telehealth services for their personal interest. The economics behind the development of the telemedicine system, the earnings made through the system, and the consumer's financial interest in the system require a thorough search. While the first two can be made through a combined process of business analysis, quantitative modeling, and probing the system, the third one (Customer's financial interest) requires a survey, some statistical analysis, and a clear literature review to connect the dots. Surveys on consumers' perspectives are essential for figuring out what should be done to optimize an online system further. From the perspective of education, there are surveys on the satisfaction perception among the teachers of a university in the utilization of an online service [18]. Some surveys and analyses look into the perception of satisfaction among students in using an online-based educational service [19]. Some of these surveys are based on a strong framework of survey research and statistical methodology. Since both students and teachers can be thought of as consumers from the education sector viewpoint, their perspectives are important to modify an existing system or make a new one from scratch. But in terms of telehealth, the surveys so far only show people's perception of particular telemedical systems, and the research appertaining to telemedicinal costs and profits are mostly quantitative and statistical. There hasn't been clear research depicting people's perception of telemedicine and how to optimize them in the perspective of Bangladesh. Although there are many theoretical frameworks for many aspects of telemedicine (such as the analysis on the merits and demerits of telemedicine), the consumer side analysis of the sector hasn't been looked into. Moreover, many other questions remain unanswered, for example, consumer opinion on independent telemedicine providers or the thought of continuity for the industry.

A series of responses to selected questions from the consumer end shall allow future telemedicine researchers and their respective financial analysts to delve into the human perspective of the market and make developments accordingly. The consumers' usage, payment, satisfaction with cost, future interests, and personal behavior regarding telemedicine are necessary tools to further optimize the economics behind a telemedicine model. An analysis of these unresolved and under-analyzed issues is the main aim of this paper. The paper tries to resolve these issues through a well-rounded survey consisting of questions relevant to the problem. The responses to the study shall allow both private enterprises and public health analysts to try to figure out the optimal course of action and thus try to create models that try to fit the majority and see the contemporary online health scenario through the eyes of the consumer.

2. Background study

Within three years of internet penetration (1996) into the country, Bangladesh developed its first telemedicine service in 1999. A charitable trust named Swifne Charitable established a link between the Center for the Rehabilitation of the Paralyzed (CRP), Dhaka and, Royal Navy Hospital, Haslar, UK. The technology it used consisted of email correspondence and digital cameras to capture still images to be transferred using email. In that same year, a private company named Telemedicine Reference Center Ltd. (TRCL), with the Ministry of Health and Family Welfare of the Government of People's Republic of Bangladesh, initiated its journey with 200 specialists. This helped doctors identify diseases at their onset to pervert further complications and thus played a significant

role in ameliorating rural healthcare. In 2001, it made a test run of a telemedicine system between physicians from the USA and Bangladesh.

In mid-2000, Grameen Communications made a name for itself by using wireless technology to support rural tele-health. Grameen has involved itself several times in the telehealth sector after its formal entry into the industry in 2000. They developed telemedicine services in cooperation with the Diabetic Association of Bangladesh (DAB) to make a patient-doctor conference for a cost of 600 Taka (with repeat visits costing less) in 2005. Moreover, in 2006, they developed a unique telemedicine service, "HealthLine Dial 789" with TRLC to create a telephone/mobile phone-based service that provided medical information and real-time medical consultation to 10 million subscribers. In addition, in 2007, a performance improvement program was launched for rural health workers in Magura in collaboration with the Bangabandhu Sheikh Mujib Medical University of Bangladesh and the International Institute of Information Technology (IIIT) of India. Later, in 2013, another program was launched in Jessore where patients had to pay between 200 and 300 taka for expert healthcare.

In 2003, Sustainable Development Network Program (SDNP) connected four regions of Bangladesh (Cox's Bazar, Dinajpur, Satkhira, and Mymensingh) to their head office using point-to-point radio and VSAT22 Satellite technology. This allowed physicians to support some of the most remote ends of the country. Thus, this acted as one of the first long-distance inter-district national telemedicine services with powerful technological influences.

With a slow but steady flow, telemedicine began to make a mark as the years went by. The government led some, some by private enterprises, while others through international means. Even universities had involved themselves in such programs. For example, in 2003, Bangladesh University of Engineering & Technology (BUET) and Comfort Nursing Home, with financial backing from the European Union, started a telemedicine project that is presently dysfunctional. Hospitals also made use of the booming technology industry. For example, since 2006, Medinova hospitals have signed an MoU with Apollo Hospitals India. They offered international (Indian) engagement for expert health checkups without the requirement to go abroad. These cost patients a bulky sum of $1000.

Some specialized telehealth services initiated their journey in Bangladesh's telehealth industry. For example, in 2011, Aponjon mHealth was created in Bangladesh through USAID to reduce maternal and neonatal mortality. It used mobile subscription technology for service, complaints, and queries. BRAC, a non-governmental organization in Bangladesh, developed Mobile Maternal, Newborn, and Child Health (MNCH) Telemedicine Services, which worked for the people living in slums. BRAC had also initiated the Manoshi project in 2007 at nine city corporations of Bangladesh, which aimed to alleviate the conditions of women and children in the slums. Shastho Sebeka and Shastho Kormi are this project's survey-based wing, which aids in the logistic analysis and information-based decision for the Manoshi project. The project was extended to include telephone services. The patient provided details on the issues that they suffered from, and the required action was taken. Moreover, a phone-based message service was initiated to provide advice regarding pregnancy and reproductive health (where the patient had to send an SMS to 16345). Specialists developed the advice from WHO, UNICEF, and the reproductive health program of the ministry. Together with Entra Health Systems of the USA, TRCL also introduced a phone-based health service system for patients with diabetes called "Amcare" in Chittagong, Sylhet, and Dhaka. The system used a blood glucose level test with a Bluetooth glucometer connected to a mobile phone which would later transfer the result via mobile phone to the Amcare Diabetes Call Centre for expert analysis.

The Ministry of Health and Family Welfare of Bangladesh initiated telemedicine services which were limited to only eight Government Hospitals, two specialized hospitals (Bangabandhu Sheikh Mujib Medical University (BSMMU) and National Institute of Cardiovascular Diseases (NICVD)), three district hospitals (Shatkhira, Nilphamari, and Gopalganj) and three sub-district hospitals (Pirgonj, Dakope, and Debhata). There were many implementations to make the government's pathway to telehealth a success. Web cameras were installed in each sub-district, district, medical college, and postgraduate institute hospitals to facilitate interpersonal video conferences between the doctor and the patient. Mobile phones were given to the hospitals mentioned above to make emergency phone calls to curtail the initiation of any disease. They also constructed a dedicated website (www.dghs.gov.bd) to find out the necessary information, phone numbers, addresses, and health notices.

Before the onset of the COVID-19 pandemic, we can see that most of the telehealth and telemedicinal programs were government-based and had a variety of specializations. After the rise of the pandemic, many private enterprises took up the role of providing telemedicinal services. Historically, the costs of telemedicine have deeply varied from being free (in the case of some governmental ventures) to $1000 (Medinova). These initiatives soon paved their way in creating the contemporary healthcare scenario of Bangladesh [20,21].

The true rise of telemedicine began after the advent of the COVID-19 pandemic. Private and public institutions used these to aid those in suburban or rural regions and give a set of guidelines to curb the spread of the virus [22].

As a sign of government commitment to telemedicine service, the government initiated a website that guidelines emergency cases [23]. Moreover, many private enterprises came with different sectors of specialization. Praava Health, Maya, Daktarbhai, Doctorola, and Sebaghar are some few to mention. As shown in Table 1, other modern telemedicine companies have different payment methodologies.

The diagram in Fig. 1 represents the basic financial framework present in a telemedicine/telehealth system. It also describes the flow of data and the systematic procedures that are involved. The doctor signs up and then lists their area of specialization before setting up a separate consultation fee and accepting a booking time. From the user end, the patient signs up, searches, and matches up with the required healthcare provider before booking an appointment and making a payment. The system administration in the middle manages the platform, the database, the backend, and the necessary parts. In exchange for the maintenance, the administrator earns a commission. On the other hand, the doctor being a part of the telemedicine system makes a part of the total commission.

Although much work is done with the architecture and control management of these systems, the impact of what the consumer thinks about a particular telemedicine system is something that should be kept in mind. A consumer's interest should be researched to assess the impact of analyzing such surveys to see how human perspectives about a business item can help future financial and technological analysts make a new system. Such research will also answer several hypothetical questions: Is a model economically viable in the long run, or Does the market expect longevity, or How much impact does it place on the modeling process?

3. Literature review

With regards to age, few papers involve the importance of age for telemedicine distribution. In some surveys, the youth are more interested in utilizing telemedicine due to their readiness for technology. In the USA, a survey carried out in 2019 reported that 74% of 18–34 years old are willing to use telemedicine while 16% of them have already utilized them [29].

In a population-based study conducted in Alberta, Canada, by Rennert-May et al., there was a significant reduction in daily medical and surgical hospital admissions following the period of COVID-19 (March 16-September 23, 2020). There was also a substantial decline in visits to the E.D. for any given reason. Multivariable negative binomial regression models were used to compare daily numbers of medical/surgical hospital admissions between the pre-COVID and post-COVID

Table 1
Payment strategy of different telemedicine enterprise.

Name of Enterprise	Business model and cost methodology
i) Daktarbhai [24]	This provides different telemedicine related services such as video consultations, doctor information, e-PHR, home pathology, ambulance and blood bank contact, as well as miscellaneous services such as a blog where patients and doctors can share their experiences. It runs on three package systems – SHUCHANA, PRERONA and PROTYASHA. These three different packages have different services. The greater the cost, the greater is the number of benefits. The lowest cost is in the SHUCHANA and PRERONA package (150 taka per 90 days package) and the most expensive is in the PROTYASHA package (1000 taka per 365 days package)
ii) Maya [25]	This is solely based to cater to women's needs, from skin care, hair and personal care (menstruation and contraceptives) to even COVID-19. The service is mainly based on an online shopping environment, where different health related items cost different amounts. Things are often sold in a package system where combo offers can alleviate costs.
iii) Praava Health [26]	This provides two different types of video consultations plans: single video consultation and premium consultation plan. The single video consultation plan allows E-prescription that costs 400 taka per time use. The premium consultation plan has three different sub-divisions, all of them covering four family members. The 3-month plan costs 1599 taka, the 6-month plan costs 2999 taka, and the 9-month plan costs 4999 taka. The more costly the plan, the more benefits there are.
v) Doctor Dekhao [27]	This is a mobile application-based telemedicine service that has the additional advantage of having an agent from which a patient can take telemedicine service from. It has a variety of package systems with various time durations: 3 months, 6 months, and 1 year with costs ranging from only 100 taka to 1200 taka. The package system is not based on the "greater the money, greater the benefits" system. Rather it is on the different types of services provided (child related service, female related service, youth related service, elderly related service as well as emigrant related service).
v) Sebaghar [28]	This has several features: a blog site, registration web page, doctor along with hospital information among other things. Instead of packages, Sebaghar is based on individual payments asked by physicians and medical practitioners. The address, experience, alma mater and certification data are provided to the patient and the reader to compare and contrast before deciding on which doctor to choose. The lowest price (found so far) for video consultation is 100 taka and the highest price (so far) is 1000 taka. There are some physicians whose prices have not been given explicitly.

public health measures. E.D. visits and the most common reasons for hospital admissions were measured through their modeling method. This was a significant research paper because rather than being narrowed down to a single disease, this paper worked on a large part of the population [30]. In another research done by Birkmeyer et al. on hospital admissions in the U.S. during the pandemic, there was a sharp decline in the number of entries beginning from March 2020 (almost a 50% decline). The reason for the decline was attributed to patients wanting to avoid seeking hospital care. This was perhaps out to fear of contagion coming from media reports or as a result of state stay-at-home orders [31]. From the perspective of Bangladesh, according to research led by A T M Hasibul et al., there was a 50% reduction in acute stroke admission during the COVID-19 pandemic. However, it wasn't mentioned whether it was due to fear of COVID-19 infection or other issues [32]. Nonetheless, it is noteworthy that hospitals in different parts of the world had lost many of their visitors due to known and unknown reasons during the COVID-19 era.

In a cross-sectional analysis of telehealth use during the emergence of the COVID-19 pandemic in the USA from January 2020–March 2020 by Koonin et al., there was a sharp rise of over 50% in telehealth usage. Policy changes and regulatory waivers from Centers for Medicare & Medicaid Services in response to COVID-19 and provisions of the U.S. Coronavirus Aid, Relief, and Economic Security (CARES) Act were thought of being the reason. According to the paper, availability and easy dispersion of telehealth services may act as a good counter against rising public health emergencies [33]. In a business-based research report by McKinsey & Company, as of July 2021, telehealth utilization in the United States had now reached 38 times higher than before the pandemic struck. The consumer and provider perspective has also changed, and policy and regulatory changes allowed easy access to telehealth care. From a financial viewpoint, the study found that investment in virtual health care has risen sharply (3 times from 2017), and several virtual healthcare models (and respective business models) are being developed to ease access, affordability, and convenience [34]. Changes are also being made in India. According to a research article by Dash et al. although there are challenges such as no formal training, poor access to healthcare facilities, and a large population to cater to, decisions are being made to move forward. For example, in Madhya Pradesh, the state government has linked its eSanjeevani telemedicine platform to about fifty Primary Health Centers (PHCs) for patient follow-up and care. Five days since the rollout in August 15, about 1000 patients have availed themselves of the service. The COVID-19 situation has given way to an 'Overton window' of political possibility, giving the public a wide range of healthcare options to choose from. This opening shall thus allow new regulations and policies to develop [35]. Unfortunately, there isn't any such scoping analysis of telemedicine numbers or percentages in Bangladesh during COVID-19, which could have helped show the effect of ICT in terms of healthcare in Bangladesh. But there are some individual analysis cases; for example, about 75,000 people had taken help of Sebaghar medical application over the last six months in 2020 [13].

Telemedicine also acts as a countering factor for the recent advent of COVID-19. From an international point of view, telehealth is often used as a countering factor against COVID-19 and as a primary checkup point for those suffering. According to Dedi Gilad, CEO and co-founder of Tyto Care (a telehealth-based company in the USA); hospitals are shifting towards telehealth systems to treat patients infected with COVID-19 while they are quarantined. Moreover, it is being urged to the public and medical staff to use telehealth solutions for primary, non-critical situations to facilitate the increasing burden faced by hospitals. According to Dr. Siaw Tung Yeng, telehealth is used extensively for the primary reporting of patients. A basic idea about their ailment before is thus received. The patients are then put into care clinics [36].

There is ample research involving the perception of the usage of telemedicine among users through social media. In China, for example, survey research carried was out by Leung et al. The Chinese social media site HC3i.cn was used to examine the perception of telehealth in China. It has been shown that despite the technology's vast prowess over most healthcare systems, there were still many doubts and questions regarding the cost and the effectiveness of the system. Although the paper has noted that there may have been limitations, it still gives an idea of a survey system that bases telemedicine abilities through social media users [37]. In another research article by Li and Zhang, they hypothesized that social media could solve the problem of paying for telemedicine projects made temporarily (citing Facebook and WeChat). According to them, people can be advised about using the said social media sites to help limit the severity of patient traffic to the physicians. Follow-up services can also be implemented to make it more attractive to consumers. They also extended their idea to note that social media is also a good platform for governments and health authorities to assess and respond to future health-related issues [38]. A research was done in the U.K. on the perspectives of telemedicine for inflammatory bowel disease (IBD) using social media in which 112 patients took part. Only 32 patients admitted to using social media in connection with their IBD, of which 19 patients used it to gain general information about their condition. 16 used it as a coping mechanism, 15 used it to get advice related to the disease, 9 used to relieve themselves from anxiety, and 2 used it to befriend others with the same condition. In the same research,

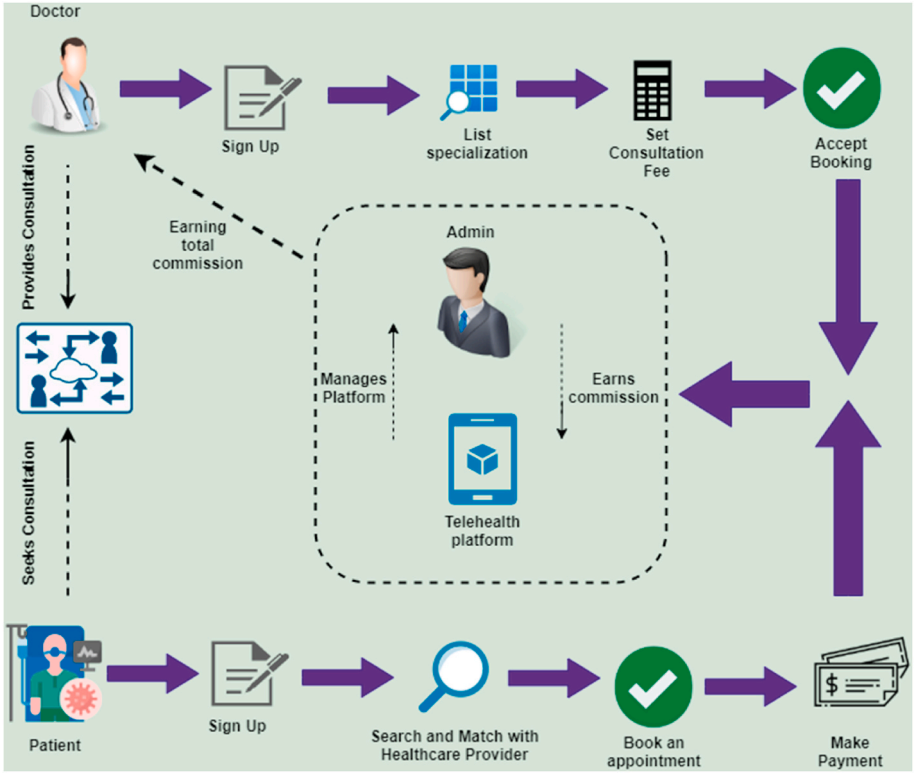

Fig. 1. Basic framework of a telemedicine system.

81 patients were interested in getting telemedicine through social media platforms. This research thus entails the practical usages of social media as a platform for telemedicine [39].

Other than social media, mobile applications are also starting to become popular methods of telemedicine. Mobile healthcare applications are slowly becoming popular, and many of them are taking over to help out the contemporary health scene. Before the advent of the pandemic, mobile healthcare applications were not very highly looked up to. For example, in a research done by Ventola in 2014, although medical applications are essential tools for healthcare professionals, some are still reluctant to use them since they don't have thorough knowledge about their risks or their benefits [40]. Therefore, evaluation and validation of such systems are a must to make them successful and user-friendly. Even from Bangladesh's perspective, the beginning of mobile health applications was quite rocky. In research done by Nazrul Islam et al., different healthcare applications were clustered and then isolated for further study on 30 users of that system. They found that 61% of usability problems were significant, while about 21% did not have a medically aesthetic or minimalistic design. These issues prevented the applications from getting very popular [41].

Websites are often the most accessible forms of online healthcare service provisions. Although there were many telemedicine websites before the rise of the pandemic, the pandemic acted as a perfect fruiting ground for different telemedicine websites. The Government of Bangladesh has a telemedicine website with pages dedicated to COVID-19 advice and issues [42]. A scoping study was made by Nazrul Islam and Najmul Islam on the digital interventions against COVID-19 from the Bangladeshi perspective. They found several websites, applications, and other online resources designed to tackle the COVID-19 pandemic. There were many mobile applications in Bengali acted as trackers, statistics sites, guidelines, etc. According to the authors, Bangladesh can succeed if the public and private sectors come together [23].

There are many studies involving different countries that speak of the satisfaction or the dissatisfaction of telemedicine. A large-scale survey study was carried out by Ramaswamy et al., which lasted for almost a year (from April 1, 2019, to March 31, 2020). It studied 38,609 patients (of which 620 were video visits and 37,989 were in-person visits). Pre-COVID and post-COVID numbers were compared. There was an 8729% increase in video visit usage during the COVID-19 pandemic compared to the same period last year, and video visits were a reason for great patient satisfaction. The conclusion drawn using Wilcoxon-Mann-Whitney hypothesis tests was that patient satisfaction with video visits was high and thus not a barrier toward a change from the norm of medical approach [43]. In an interesting analysis approach, Andrews et al. reviewed eighteen articles utilizing PubMed, CINAHL, Google Scholar, and Cochrane Library databases published from January 2020 to July 11, 2020. Out of the total number of 18, 16 of the papers evaluated patient satisfaction towards telemedicine. Moreover, there were high levels of satisfaction with telehealth usage during the COVID-19 pandemic, and many patients and healthcare providers were interested in continuing the system. Thus, this would mean that the telehealth industry is promising [44]. According to research carried out in Bangladesh by Chowdhury et al., it is unlikely in Bangladesh that telemedicine can replace the healthcare services that are present in person. But the advent of the COVID-19 pandemic has given the services a chance to thrive. It is quintessential for online healthcare providers to address the many underlying issues to make the most of it and try to curtail the spreading of the virus. Thus, according to the paper, it is challenging to expect consumer satisfaction, and the satisfaction has to be ensured through many means [45].

Regarding the economics behind telemedicine, several analyses and theoretical implementations were conducted. In terms of individual cost of telemedicine usage, 28 quarantined travelers were tested positive for COVID-19 and were evaluated using telehealth. The total expenditure during the quarantine and the subsequent treatment was $193,938, equating to $894 per individual. Thus, the authors concluded that telehealth was a good screening and pre-analysis method that could help to provide timely disease management [46]. A scoping research done by Snoswell et al. used generalized and targeted literature review on telehealth and its related economics. The researchers concluded that the

costs were based on various considerations. According to the research, telehealth only reduced prices related to travel and only if the online systems mitigated the need for an expensive procedure or specialist follow-up. There were four facets from where prices could be saved: productivity gains, reductions in secondary care, alternate funding models, and telementoring. It would thus be difficult to curtail large amounts of costs. According to the paper, alternate funding models might help by finding ways to allow the consumer to spend money on the system. In conclusion, although telehealth is presently in a stage where it can safeguard the user's health, the methodology required to save costs and bring profit is still a matter of deep consideration [47]. Zeltzer et al. made a quantitative econometric approach to see how the rise in telehealth can alleviate health costs. The strategy put the potential selection into either a remote or in-person setting by considering all visits (remote and in-person) of patients with high and low access to telemedicine. This was put into proxy based on the adoption of telemedicine by their primary care physician. Then outcomes of patients with high and low telemedicine access were measured in the pre-COVID period. Overall, they found that telemedicine slightly increases care utilization, offset by a decrease in average episode intensity, resulting in a slightly lower cost. Access to telemedicine has only modest impacts on outcomes of primary care visits, subsequent follow-ups, and overall utilization and cost over the 30 days following each visit. Thus conclusively, there is no sizeable empirical proof that telemedicine is still in the state of saving large amounts of health costs. [48]. There was also a well-rounded research paper by Ashwood et al. which worked on whether costs decrease in some cases of telemedicine usage and whether the correct sort of physician care is being provided. They worked on over 300,000 telemedicine respondents and focused on acute respiratory infections (bronchitis, sinusitis, pneumonia, etc.). They found that although per episode spending was lower if the patient had utilized a direct-to-consumer telehealth visit compared to an in-person visit (while the telemedicine cost was $79, the in-person cost was $146) the convenience of telehealth led to greater use of care and therefore increased health care spending [49]. In one of the first telemedicinal economics-related surveys carried out in Bangladesh, there were many questions, some of which were related to telemedicinal (but not concrete) costs. The survey consisted of bar charts that represented the distribution of responses to telemedicine-related questions and supposed cost distributions. The final results of their research are:

i) The expected consultation fee range of 51–100 taka was considered acceptable/sufficient by the most significant fraction of respondents who were rural/local doctors.
ii) The expected consultation cost range of 201–300 taka was considered manageable by the greatest fraction of respondents (52%) who wanted to avail telemedicine service in the village without going to the urban areas for their health care.
iii) 40.16% of pharmacy owners consider that if the telemedicine service was implemented in the pharmacy of a local village or union area, the distribution of income percentages should be in the range of 0–20%
iv) The most proposed fee range by pharmacy owners was 51–100 taka.

The final mathematical analysis by the paper concluded that the expected fees for telemedicine should be made in accordance with the range proposed by the patients. Thus the payment should be 300 taka, where the expert doctors would get 150 taka, village doctors would get 75 taka, and the pharmacy owners would get 75 taka per patient. A payment of 300 taka will thus be much cheaper than an average cost of 500–1000 taka in an urban environment which will save the cost and time spent on transportation [50].

Kwakernaak et al. worked on patients' use of the internet to find reliable medical information about minor ailments and how they did it. The survey consisted of 1372 participants divided into three search strategies: hypothesis testing, narrowing within the general hypothesis area, and symptom exploration. They performed different statistical and computational tests to determine the quality of the website, the diagnostic accuracy, and the factors which led to the search. Browsing the internet did not lead to a statistically significant change in participants' beliefs about the severity of the condition. Also, 65% of the participants shared the information they found with their physician, and most of them (75%) received a positive response. In conclusion, the authors wrote that symptom-based search was the most common. But if patients expect the potential diagnosis to be severe, they tend to use a hypothesis verification strategy more often. Therefore, they are prone to certain forms of bias, and high-quality websites need to be made, making the decisions more accessible for the consumers to take [51].

But self-diagnosis brings about a debate since there are supposed benefits and supposed demerits. According to an Honor's Thesis by Meghan Alesia Gass, some of the supposed benefits are [52]:

- it can be calming for the person to know what he/she may be suffering from,
- it might give them a better foothold of understanding their conditions,
- the internet can help to relieve medical jargons that the doctor may use,
- the internet can act as an ameliorating device.

On the contrary, some of the supposed demerits were:

- if the data in the websites were mishandled, it may have terrible consequences,
- the people may not have a correct grasp on the data that they are viewing and may thus misinterpret it,
- the data in the websites may have dubious accuracy.

These comparisons allow one to rethink self-diagnosing themselves using the internet.

In a literature review-based analysis done in 2010 by Annemarie Jutel, 39 published articles from PubMed self-diagnosis were analyzed. Of those, 12 papers found self-diagnosis to be reliable and desirable, 9 found it unreliable yet desirable and 11 found it neither desirable nor dependable. The remaining ones (6 papers) had mixed views [53]. Another survey done was done on 12,000 telemedicine receivers to estimate the rate at which people search for information on their medical symptoms before receiving a formal medical diagnosis by a health professional. The researchers found that on average, 15.5% (1792/12, 367) of people used the internet to query about symptoms associated with their medical condition before receiving a medical diagnosis. The longer duration between the first query for a symptom and the corresponding diagnosis was correlated with an increased likelihood of people querying about those symptoms [54]. This paper tried to explain some reasons for the frequency of self-diagnosis and how it plays out in favor of telemedicine and its related economics.

According to N M Hjelm, some of the most important benefits of telemedicine are.

- access to medical information to health professionals for better understanding.
- access to communication between health professionals.
- access to health information to the general populace as well as patients.
- improved access to health services and better care delivery.
- improved access to both primary and secondary care.
- improved professional medical education for those seeking to attain higher studies.
- maintenance of quality in screening programs.
- reduced overall costs [55].

According to Chowdhury et al., some barriers of telemedicine from the Bangladesh perspective in the COVID-19 pandemic times are as follows [56]:

- limited access to ICT and internet subscription – thus a problem in connectivity.
- lack of internet awareness; the lack of knowledge of the abilities of the internet will prevent users from attaining telemedicinal service.
- lack of motivation by health sectors to open up and work on a new branch of healthcare to ease the flux of patients.
- patient dissatisfaction, which causes a lack of trust among the patients and the health practitioners.
- lack of digital security in the telemedicine sector – there is often a fear that confidential medical information may not be in safe hands.

There was also an analysis of the continuity of the industry after the hopeful conclusion of COVID-19. According to Accelerate Health 2020 Consumer Telehealth survey, a survey done on 2052 individuals found that most millennials and Generation Z respondents were more interested in paying for an online-only provider than a trusted provider since they were more comfortable with technology. They were more likely to pay more to save themselves from the bother of an in-person visit. It was concluded that while the short-term picture of telemedicine was downward trending, the long-term vision (based on the new generation) seemed to be trending upwards [51]. Thus, the future and continuity of telemedicine and its economics are dependent on the behavior of the rising youth.

4. Methodology

The survey outlined in this research is based on the following criteria:

i) The sample is of urban origins.
ii) The survey is based online.

The sample is based on people who are from cities (mainly from Dhaka and Chittagong) due to two main reasons:

- the rural population may have responses that are contrary to the urban population since their healthcare is not as thriving as those who live in cities and this may thus lead to strange statistical outcomes that could only be countered with a larger dataset
- people of rural origins need to be surveyed often in-person (due to lack of internet knowledge) since that is the best way to get to them and the lockdown due to COVID-19 prevented this from happening.

The survey is online-based due to the lockdown imposed to restrict the spread of COVID-19. Due to the health constraints brought about by the virus, an in-person survey could not be accomplished. Online surveys also have the advantage of being simultaneous, where many people can respond to questions simultaneously, and the results can be evaluated quickly through means of software.

A questionnaire had been made containing 18 questions which were divided into different sections based on their subject matter. At first, there were preliminary questions that established the sample dataset. Then, questions were related to telemedicine usage were asked. After that, questions about the costs and the worth of telemedicine usage were asked. Finally, some conclusive questions that would help provide an idea of the upcoming consumer tendencies on the telemedicine market were put forward. Some of the questions were made mandatory to answer, while some were made optional to offer responses to people with tailored responses. The questions that were present in the questionnaire were:

Question: 1) What is your age range?

Question: 2) What is your occupation?

Question: 3) How many times have you gone to a hospital during the Pandemic?

Question: 4) Have you consulted with doctors online or used internet tools to contact a doctor from a local hospital?

Question: 5) Has your usage of online health services increased during the COVID-19 Pandemic?

Question: 6) Have you used online health services for anything related to COVID-19?

Question: 7) How many times have you used online medical help during the Corona virus Pandemic?

Question: 8) From where have you sought the online service?

Question: 9) Were you satisfied with your online medical help?

Question: 10) So far how much have you paid for your online consultation (in taka)?

Question: 11) Do you think the amount paid for the service is justified?

Question: 12) If No, Why do you think so?

Question: 13) Do you often use the internet to diagnose yourself initially?

Question: 14) If Yes, How many times in a month (average)?

Question: 15) What are some positives of online medical consultations?

Question: 16) What are some negatives of online medical consultations?

Question: 17) Will you continue taking online medical consultations even after the pandemic is over?

Question: 18) Do you think a telemedical company which is not directly under a hospital is trustworthy?

A Google Form was made which acted as the online questionnaire. The form was passed around through social media to as many as 1000 people. Since we figured that not everyone would be interested in taking the survey, we had planned to receive somewhere between 350 and 700 responses. This was done so that it could represent the entire urban population of Bangladesh with a low error margin. Of those sent, 413 people responded, which is a very good number since it represents the entire urban population with an error margin of $\pm 5\%$. Once we'd received 400+ responses, we didn't target any more since there wouldn't be a great decrease in the error margin and would require more time and resources. The selected dataset was then analyzed using Microsoft Excel. The data had to go through some pre-processing so that some of the sections in the analysis could be properly look at. Data visualizations through pie-charts and bar charts were made. In some cases, quantitative analysis had also been done in order to enrich the study and to put up comparisons to the works made by other researchers in the same field. The quantitative analysis had been done using statistical means and had been done making some considerations (for example: given that the sub sample consisted of only those who had taken some kind of telemedicinal help).

5. Results and analysis

Fig. 2 shows the age distribution of the survey respondents. The survey shows that it was mostly based on the youth (376 out of 413 of the respondents were between the ages of 15 and 30).

Fig. 3 shows the occupation distribution of the survey respondents. The bar chart shows that most of the respondents were students in varying degrees of education, (74% of them were students in varying degrees of education since 303 out of 408 who had answered were students).

Fig. 4 shows the number of times a respondent has gone to the hospital for any sort of medical requirement. As we can see, the majority (45%; 187 out of 413 respondents) did not go to the hospital, but a frequency range of 1–5 of hospital visits is the most common (44%; 182 out of 413 respondents).

Fig. 5 shows the percentage of respondents who used telemedicine services. From Fig. 5, we can see only about one third (37%) of the

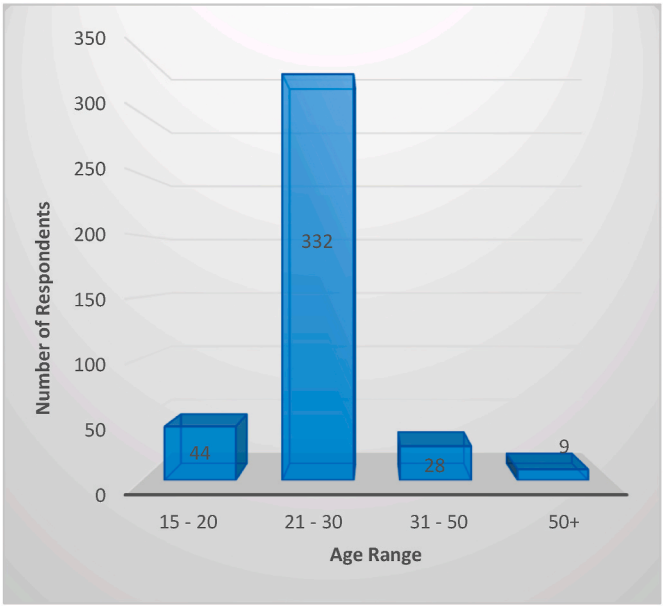

Fig. 2. Age distribution of the survey respondents.

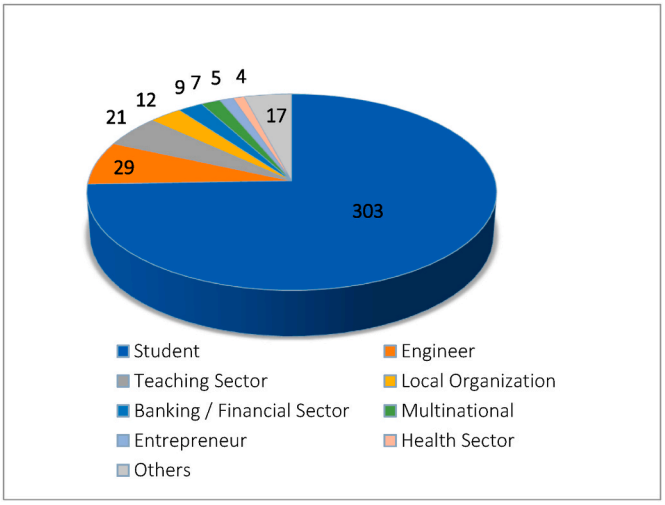

Fig. 3. Occupation distribution of the survey respondents.

respondents used telemedical services in order to avail long distance medical help.

Fig. 6 shows the percentage of respondents who agreed that their frequency of telemedicine usage has increased. As we can see, 42% agree that their usage of telemedicine has indeed increased.

Fig. 7 shows the percentage of respondents who utilized telemedicine in any form for things related to the Coronavirus. From Fig. 7, we notice that one-third of the respondents (32%) used telemedical services for COVID-19 treatment, analysis, prediction, warning or any other sort of checkup.

Fig. 8 shows the frequency of telemedicine usage among the respondents. According to the figure, more than half (57%; 239 out of 413 respondents) did not use any sort of telemedicine service (since their frequency is zero), while one third (36%; 147 out of 413) used any given sort of telemedicine service about 1–5 times per month while only 22 respondents used it 5 to 15 times and only 5 respondents used it more than 15 times.

Fig. 9 shows the sources of online healthcare the respondents had taken so far. From Fig. 9, we observed that a large fraction (48%; 86 out

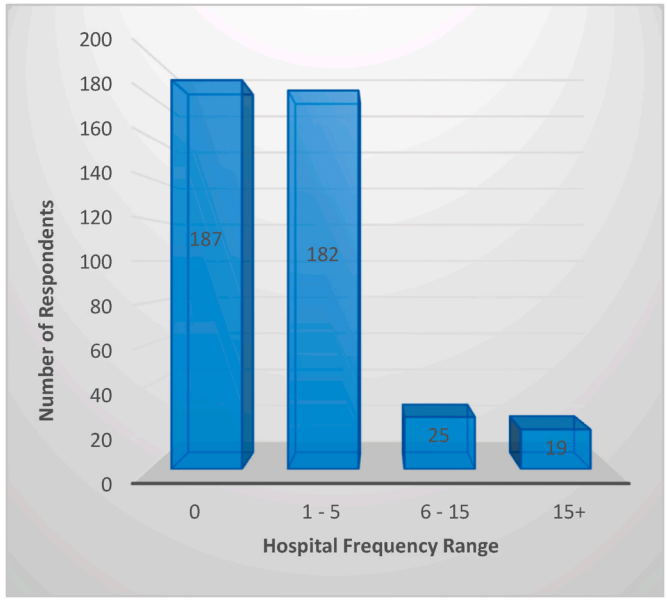

Fig. 4. Number of times a respondent has gone to the hospital during the COVID – 19 pandemic.

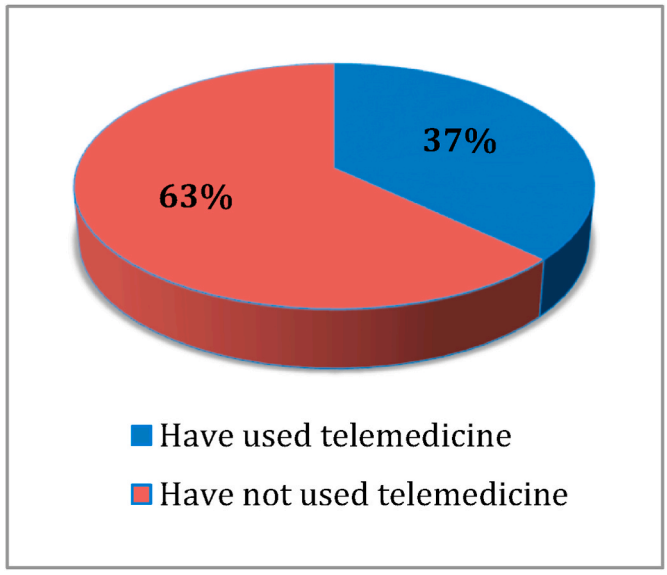

Fig. 5. Percentage of telemedicine users among the survey respondents.

of 181) used hospital telemedicine services, 74 respondents used mobile healthcare applications (such as Sebaghar or Doctorola) in order to communicate with a doctor or get data regarding a hospital, 11 used distance call, 7 used Google Search and other websites and only 3 used social communication sites (such as Whatsapp or Facebook).

Fig. 10 represents the respondents' satisfaction with the online healthcare that they received. It shows that the people who availed telemedicine aid, 75% agreed that the online healthcare they received were satisfactory while the remaining 25% were not satisfied.

Fig. 11 represents the telehealth payment distribution of the survey respondents. Of the 153 respondents who used telemedicine either during the COVID-19 pandemic or for issues prior to that or to simply check and analyze any sort of ailment that the person (or their loved ones) is suffering from. According to the distribution presented, the largest share is present in the 0 to 100 range. The next share is carried by the largest amount: the 1000+ range. The 101 to 300 range has the least

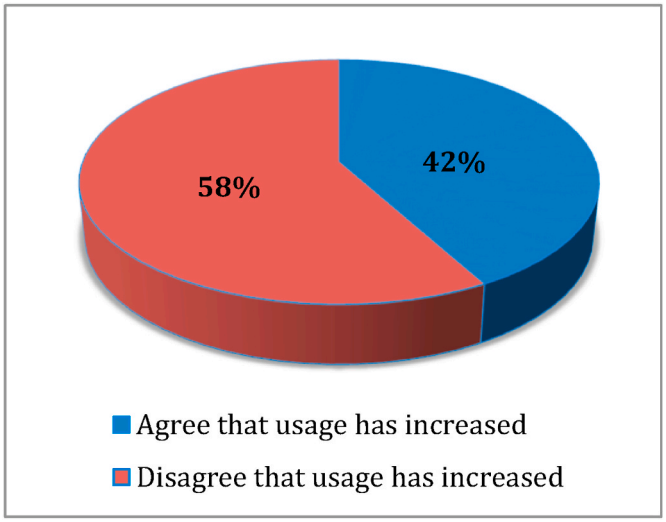

Fig. 6. Percentage of respondents who agree that telemedicine usage has increased.

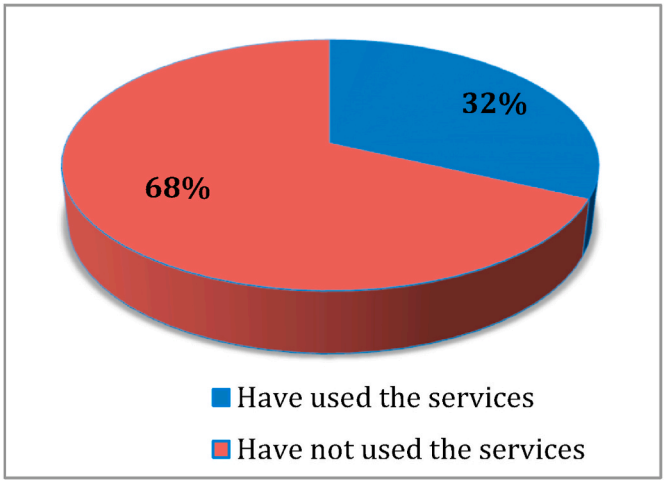

Fig. 7. Percentage of Respondents who have used Telemedicine Services for the Coronavirus (Yes: people who used, No: People who did not use).

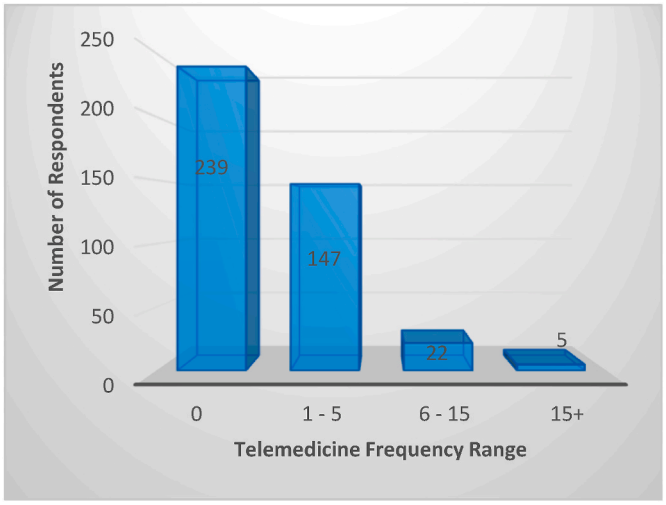

Fig. 8. Frequency of telemedicine usage.

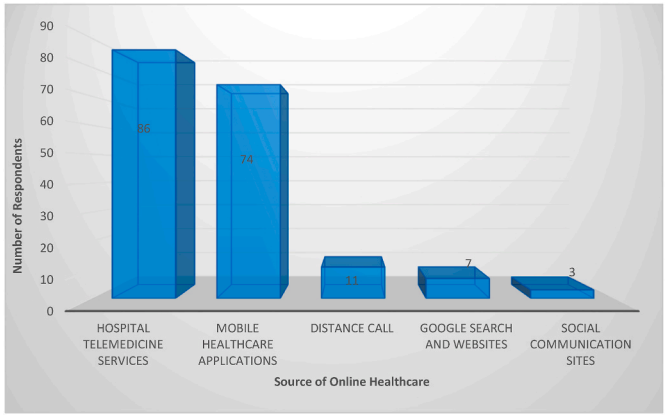

Fig. 9. Distribution of sources of online healthcare among the survey respondents.

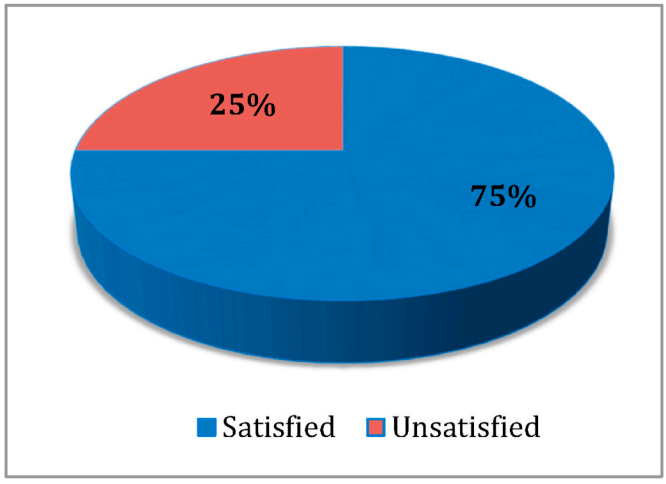

Fig. 10. Percentage distribution of respondent satisfaction with online healthcare.

Fig. 11. Distributions of telehealth payment ranges.

number of respondents (15 users out of 153 who had paid for telemedicinal service.) The 300 to 500 and 500 to 1000 ranges have 22 and 33 respondents respectively. Thus, through calculation, the mean value stands at 532 Taka.

Fig. 12 shows whether the respondents who paid for telemedicine

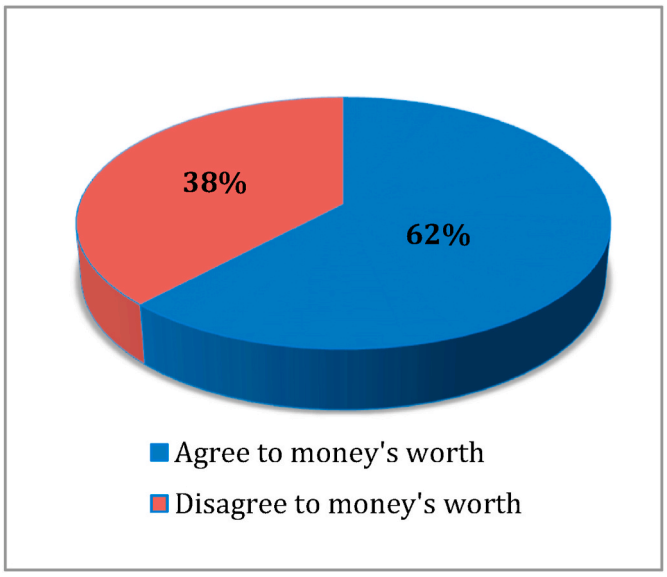

Fig. 12. Respondent distribution to worth of payment.

found the service worth of payment. The "yes" response has been the mostly chosen (62%) while the "no" responses were about 38%.

Fig. 13 shows the reason of dissatisfaction for the telehealth service received. The results of dissatisfaction in Fig. 13 show 39% (67 out of 171 total responses) who used the telemedicine service said that the diagnosis was not very good. On the other hand, 101 out of 171 responses (59%) who used the telemedicine service said that the service could have charged less. A small number (3) had a sense of distrust.

Fig. 14 shows the percentage of respondent who diagnosed themselves initially through the internet. According to Figs. 14 and 39% of the respondents agreed to using the internet to try to diagnose themselves for any sort of ailments beforehand (162 out of 413 respondents), and about a half of the respondents (45%; 185 out of 413) abstain from using the internet in order to diagnose themselves for any diseases, the remaining 16% (66 out of 413) are unsure of their affiliation.

Fig. 15 shows the percentage of frequency of self-diagnosis among the respondents. According to the Figs. 15 and 88% (142 out of 162 of those who self-diagnose initially through the internet) of the users self-diagnose themselves 1 to 5 times per given month, while only 7% the users (12 out of 162) self-diagnose themselves more than 6 to 15 timer per given month and only 5% (8 out of 162) self-diagnose themselves more than 15 times through the internet.

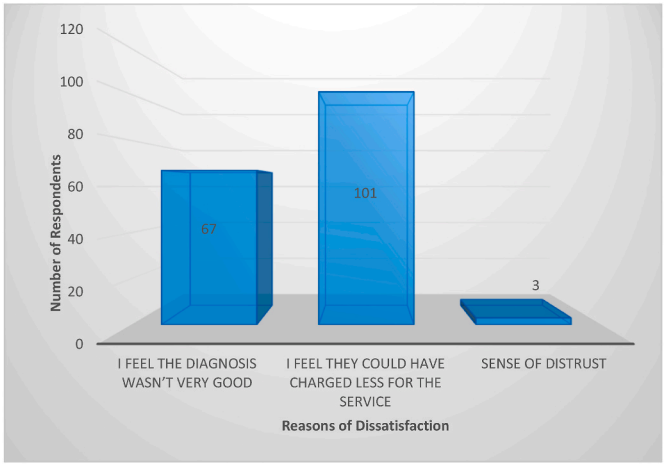

Fig. 13. Respondents' response to reasons of dissatisfaction with telehealth service.

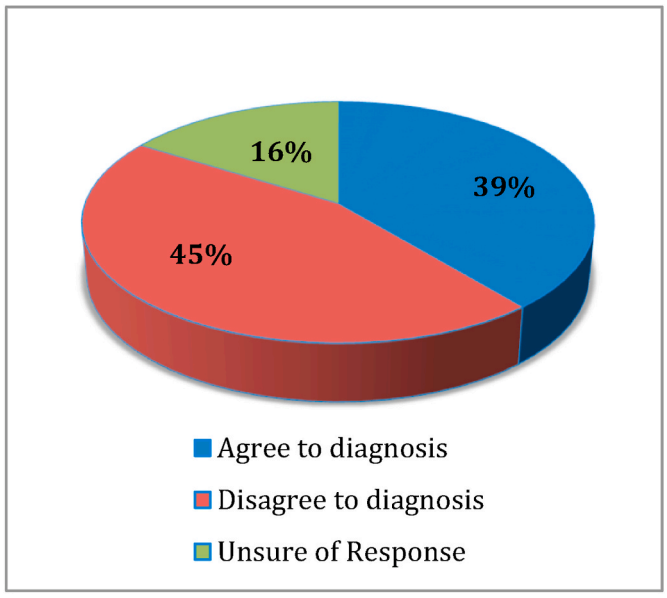

Fig. 14. Percentages of respondents who diagnose themselves initially for any symptoms/diseases using the internet.

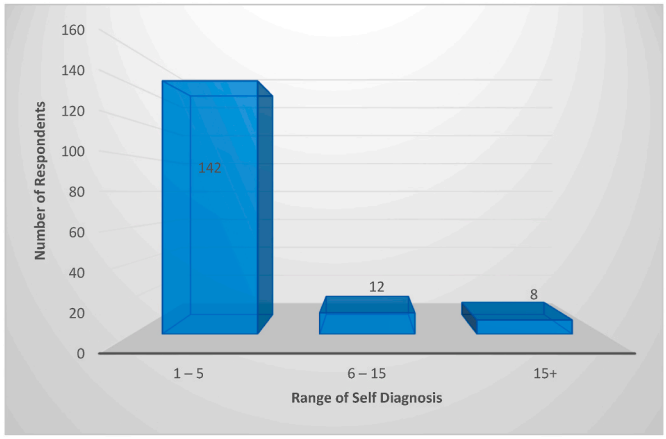

Fig. 15. Percentage distribution of frequency of self-diagnosis using the internet.

Fig. 16 represents the distribtion of choices of the merits of telemedicine usage by the survey respondents. As shown by Fig. 16, the responses were:

- 106 of the respondents preferred/liked telemedicine since it did not involve going out often,
- 98 of the respondents preferred/liked telemedicine because it meant that the patient can save some money,
- 89 of the respondents preferred/liked telemedicine since the botheration of some logistic situations such as waiting for a line, making appointments in person are removed and thus creates a sense of ease for the patient/user
- 62 of the respondents preferred/liked because they believed that telemedicine provides more general information than a personal consultation in a hospital
- only 3 of the respondents preferred/liked because they felt safe in its usage during the era of the pandemic

Thus, the fact of not going out often gets the biggest credit.

Fig. 17 represents the distribtion of choices of the demerits of

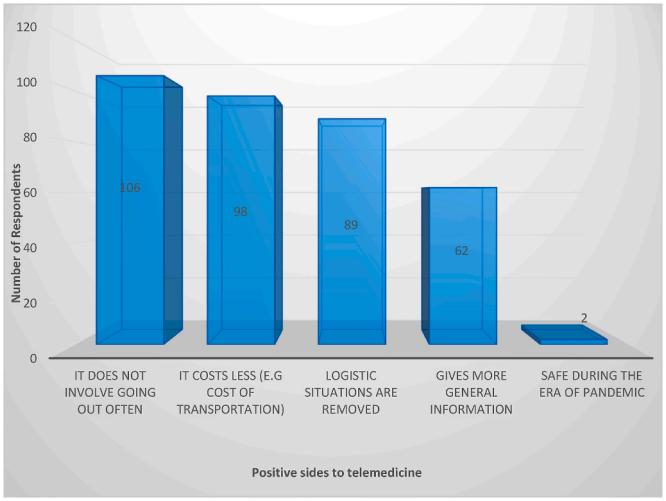

Fig. 16. Respondents' response distribution of choices of positive sides of telemedicine.

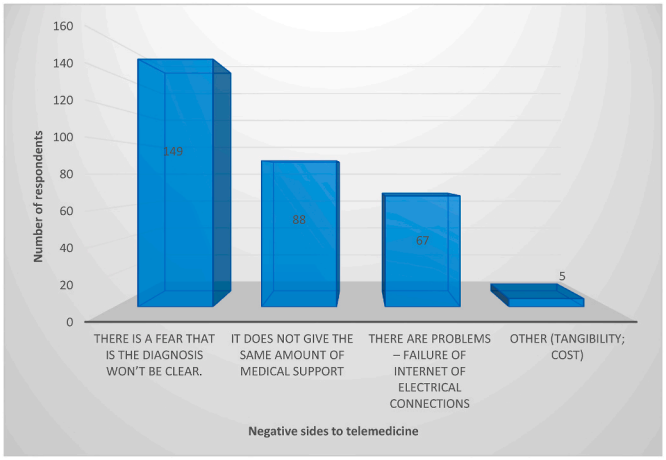

Fig. 17. Respondents' response distribution of choices of negative sides of telemedicine.

telemedicine usage by the survey respondents. As shown by Fig. 17, the responses were:

- 149 of the respondents disliked/did not prefer telemedicine (by far the most) since they feared that the diagnosis or the conclusion that the physician would reach may not be a clear one
- 88 of the respondents disliked/did not prefer telemedicine since they believed that it did not give the same amount of medical support,
- 67 of the respondents disliked/did not prefer telemedicine because they believed that they would suffer logistic problems appertaining to connectivity,
- 5 of the respondents disliked/did not prefer telemedicine (by far the least) because they thought that it cost much more than traditional medical practices.

Fig. 18 shows the survey respondent response distribution of the continuity in taking online medical consultations. On the question of continuity, positive responses (22%; 84 out of 387 respondents) to continuity of taking online healthcare were the least, while unsure responses were the most (48%; 186 out of 387) and negative responses (30%; 117 out of 387) were about one-third.

Fig. 19 shows the survey respondents' thoughts whether telemedical company which is not directly under a hospital is trustworthy or not. As

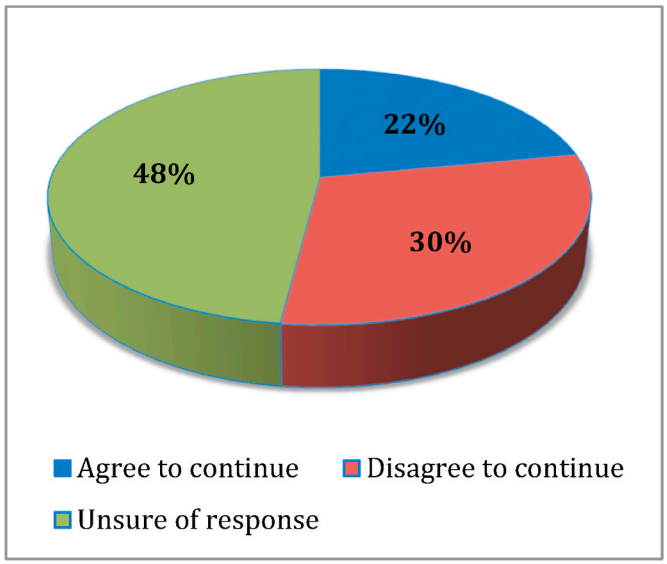

Fig. 18. Respondents' response distribution in continuity in taking online medical consultations.

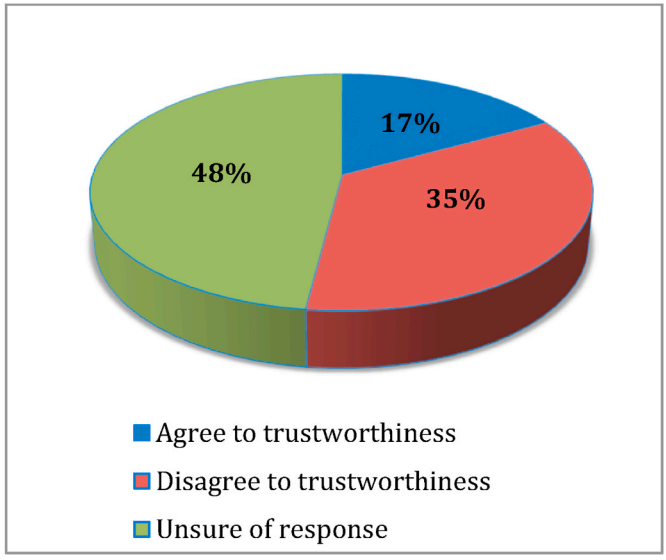

Fig. 19. Responses to whether a telemedical company not directly under a hospital is trustworthy.

shown, the results are skewed towards the negative, the number of negative responses (35%; 143 out of 413) are almost twice the number of positive responses (17%; 71 out of 413) albeit the majority of the responses being unsure (48%; 199 out of 413).

6. Discussion and future consideration

Based on Figs. 2 and 3, although there is a distribution of people of various occupations and ages, the main concentration of the survey respondents were young students, since 91% (376 out of 413 respondents) were between the ages of 15 and 30 and 73% (303 out of 413 respondents) were students. As per a Bangladesh National ICT survey, about 80.17% of the internet's users are between 15 and 24 [57] (the most common age range of studentship). From this, one can derive that telemedicine can be utilized as a good tool for healthcare for this given demographic – either for them or their loved ones.

Fig. 4, which details hospital frequency, shows that although there is

a constant presence of a large frequency (5–15 times and 15+ times), the large number of respondents who have not gone to any hospital show that there is a hesitation in visiting hospitals due to infectious disease (COVID-19). Based on this fear, the telemedicine industry can act as an alleviating factor to counter the requirement to stay safe and the importance of looking for healthcare.

Figs. 5–7 all show some disappointing analysis among the given population. Only about one-third of the respondents have contacted their local hospital or used the internet to speak to a doctor. Only about 40% of respondents agree that utilization of telemedicine has increased in their daily internet usage, and only about one-third of the respondents have used the internet for aid regarding the COVID-19 pandemic. These low numbers are due to a combination of issues: poor knowledge about the systems of telemedicine, habitual biases towards face-to-face healthcare [58], poor ICT culture among health professionals [59], lack of trained health staff, low health literacy [60], and also a lack of a robust digital security law imposed on telemedicine systems of Bangladesh to protect the data of users. Combining these three statistic ideas presented can help health analysts figure out ways to increase these numbers for a better future in healthcare and its related economics.

As per Figs. 8 and 57% of the respondents have not used any form of telemedicinal aid for any given reason during the pandemic, and about 36% of the respondents have used it between 1 and 5 times (and the usage frequency lowers heavily afterward), meaning that telemedicine usage in the country is still at a very minimal range. This idea could impact future telemedicinal enterprises to base their models according to the given decisions and demonstrate the importance of basic internet usage for health purposes.

Fig. 9 shows that hospital-mandated telemedicine surveys are in the lead among the many various sources of telemedical aid. The outcome of responses presented in Fig. 19 shows this, where 35% of the respondents do not consider independent telemedical services trustworthy (compared to 17% of who do). Of those who received telemedical aid, three-fourths give favorable reviews (as shown by Fig. 10), which means that although the numbers are small, there are still hopes for the industry's sustainability.

In terms of money, the largest share goes to the smallest range (as per Fig. 11). Some of the users do not use systems that cost money in a direct sense (social media, distance calls, etc.), while others have used less costly systems (for example, as per Table 1, Doctor Dekhao and Sebaghar have cheaper options that can cost about 100 Taka). It may be possible that some respondents do not consider telemedicine cost as a direct cost (but as a branch cost of the hospital-mandated services). Interestingly, the second most common option is the costliest one (1500 TK+). Table 1 explains this, where most of the enterprises have their monetary ranges way more. The other costs show an increasing pattern in terms of frequency.

Sadly, as shown by Fig. 12, one-third of the respondents who have paid for the service do not think that they have received their money's worth. The respondents think that the costs could have been lowered since it's an online platform-based service (represented in Fig. 13). There is an issue considering the strength of the diagnosis reports.

According to Fig. 14, we can see a culture of using the internet for primary and initial health diagnosis before resorting to the experts. Many respondents (142 out of 413) diagnose themselves on the internet 1–5 times. This is a good sign from a perspective that although there may not be a great demand for telemedicine service for the common Bangladeshi populace, the presence of this culture means that it can be used by telemedical practitioners to create business models based on advertisement and health necessity.

Comparing Figs. 16 and 17, we see more advantages in telemedicine where removal of logistic situations, comparatively low cost, and stay-at-home service are cited as the most important advantages. Doubt with diagnosis and technical failures are chosen as the most severe of disadvantages. But, clarity of diagnosis is the main foothold of any telemedicine system, and this is the most cited problem while compared to both figures (149 votes). Future telemedicine systems need to think of this issue while developing a model.

Fig. 18 shows another depressing find. Only one-fifth of the respondents are definite that they will continue (or consider using telemedicine in the near future) using telemedicine after the COVID-19 pandemic ends. So, to look for sustainability, particular demographic analysis and cost-benefit analysis need to be carried out by the industry experts.

Finally, in Fig. 19, only 17% agree that independent telemedicine services are trustworthy. So, from the general population's perspective, hospital-mandated telemedicine services are still very dominating, and a more significant amount of trust must be provided by independent providers.

7. Conclusion

The COVID-19 pandemic was one of the most significant health-related issues that the modern world faced. Telemedicine has posed a solution in many ways. The economics behind telemedicine in COVID-19 should be an active era of research for optimal productivity and utility by both the suppliers and the consumers.

This research provides a look into the contemporary use of telemedicine and its finances from the viewpoint of Bangladesh. The survey analyzed the respondents' telemedicine and internet health habits and later questioned the respondents' spending regarding telemedicine and their satisfaction with the transaction (this showed that the effect of cost has more significance than the effect of quality in diagnosis). The survey also showed that although there is a culture of self-diagnosis, the frequency of its usage is minimal (88% use it only 1 to 5 times per month). The fear that the diagnosis won't be clear was found to be the prevailing reason for not choosing telemedicine services, and not going out has been the most important reason for receiving telemedical aid. The payment seems to be directed towards the very low (since most websites do not take charges) and the moderately high (the price accepted by hospital-mandated telemedicine services). The survey also pointed out that most of the respondents would not be using telemedicine (or are not interested in repeated usage) after the COVID crisis is gone. Most respondents are interested in telemedicine enterprises under a hospital. A combination of these responses tells us that although Bangladeshi consumers of telehealth grew in number and are changing attitudes due to the pandemic, many financial (as well as marketing) schemes are required by the industry to keep it sustainable and economically stable in the long run.

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Declaration of competing interest

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References

[1] Shaw DK. Overview of telehealth and its application to cardiopulmonary physical therapy. Cardiopulm Phys Ther J 2009;20(2):13–8.
[2] Rodriguez-Segura L, Zamora-Antuñano MA, Rodriguez-Resendiz J, Paredes-García WJ, Altamirano-Corro JA, Cruz-Pérez MÁ. Teaching challenges in covid-19

scenery: teams platform-based student satisfaction approach. Sustainability 2020; 12(18):7514.
[3] Haus B. What's driving telehealth growth in 2019?. 06-September- InTouch Health 2019 [Online]. Available, https://intouchhealth.com/whats-driving-telehealth-growth-in-2019/?gdprorigin=true. [Accessed 23 May 2021].
[4] Telemedicine Market Size Analysis Report. Grand View Research 2021-2028 [Online]. Available, https://www.grandviewresearch.com/industry-analysis/telemedicine-industry. [Accessed 13 October 2021].
[5] Laxmi V. Global markets for telemedicine technologies. Global Telemed Market Size Share Trends Res Rep 2021 [Online]. Available, https://www.bccresearch.com/market-research/healthcare/global-markets-for-telemedicine-technologies.html. [Accessed 23 May 2021].
[6] "Home," Johns Hopkins Coronavirus Resource Center [Online]. Available, https://coronavirus.jhu.edu/. [Accessed 23 May 2021].
[7] Lotfi M, Hamblin MR, Rezaei N. COVID-19: transmission, prevention, and potential therapeutic opportunities. Clin Chim Acta 2020;508:254–66.
[8] mHealthIntelligence. Industry leans on telehealth to tackle COVID-19 outbreak. mHealthIntelligence 2020. 12-Mar-2020. [Online]. Available, https://mhealthintelligence.com/news/industry-leans-on-telehealth-to-tackle-covid-19-outbreak. [Accessed 23 May 2021].
[9] Bangladesh population 1960-2019 data: 2020-2021 forecast: historical: chart. Bangladesh Population | 1960-2019 Data | 2020-2021 Forecast | Historical | Chart 2021 [Online]. Available, https://tradingeconomics.com/bangladesh/population. [Accessed 23 May 2021].
[10] Three quarters of all Bangladesh doctors work in cities [Online]. Available, https://www.dhakatribune.com/health/2017/09/20/74-mbbs-doctors-work-dhaka. [Accessed 23 May 2021].
[11] High demand for telemedicine in pandemic | Dhaka Tribune [Online]. Available, https://www.dhakatribune.com/bangladesh/2020/08/29/high-demand-for-telemedicine-in-pandemic. [Accessed 23 May 2021].
[12] Telemedicine for Bangladesh: Bridging the Doctor-Patient Gap [Online]. Available, https://www.lightcastlebd.com/insights/2020/07/telemedicine-for-bangladesh-bridging-the-doctor-patient-gap. [Accessed 23 May 2021].
[13] Choyon SA. Impact of digital health services in the economy. Financ Express 2021 [Online]. Available, https://www.thefinancialexpress.com.bd/views/opinions/impact-of-digital-health-services-in-the-economy-1614141812. [Accessed 23 May 2021].
[14] "Telemedicine: A ray of hope for people amid pandemic." [Online]. Available: https://thefinancialexpress.com.bd/health/telemedicine-a-ray-of-hope-for-people-amid-pandemic-1588218963. [Accessed: 23-May-2021].
[15] Bartik AW, Bertrand M, Cullen Z, Glaeser EL, Luca M, Stanton C. The impact of covid-19 on small business outcomes and expectations. Proc Natl Acad Sci Unit States Am 2020;117(30):17656–66.
[16] de Vet JM, Nigohosyan D, Ferrer JN, Gross A-K, Kuehl S, Flickenschild M. "Impacts of the COVID-19 pandemic on EU industries." Committee on Industry, Research and Energy, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament. Mar-2021.
[17] Al-Zaman MS. Healthcare crisis in Bangladesh during the COVID-19 pandemic. Am J Trop Med Hyg 2020;103(4):1357–9.
[18] Zamora-Antuñano MA, Rodríguez-Reséndiz J, Rodriguez Segura L, Á M, Cruz Pérez, Altamirano Corro JA, Paredes-Garcia WJ, Rodríguez-Reséndiz H. Analysis of emergency remote education in COVID-19 crisis focused on the perception of the teachers. Sustainability 2021;13(7):3820.
[19] Juárez Santiago B, Olivares Ramírez JM, Rodríguez-Reséndiz J, Dector A, García García R, González-Durán JE, Ferriol Sánchez F. Learning management system-based evaluation to determine academic efficiency performance. Sustainability 2020;12(10):4256.
[20] Prodhan UK. A systematic analysis on the telemedicine services in Bangladesh. Int. Conf. Adv. Inf. Commun. Technol. 2016.
[21] A. M. Ferdous. "Scopes and challenges of implementing Telemedicine in a developing country like Bangladesh", Uit Munin. Master's Dissertation, May-2017.
[22] Rahman SMM, Hossain SM, Jahan M. Digital health during COVID-19 pandemic and beyond. Bangladesh Med Res Counc Bull 2020;2(46):66–7.
[23] Islam MN, Islam AKMN. A systematic review of the digital interventions for fighting COVID-19: the Bangladesh perspective. IEEE Access 2020;8:114078–87.
24 Daktarbhai Daktarbhai [Online]. Available, https://daktarbhai.com/subscription/plan. [Accessed 23 May 2021].
[25] Health: personal care: pharmacy and prescriptions - Maya. Maya Shop 2021 [Online]. Available, https://shop.maya.com.bd/. [Accessed 23 May 2021].
[26] Family doctors - anytime anywhere. Praava Health 23-May-2021 [Online]. Available, https://praavahealth.com/. [Accessed 23 May 2021].
[27] প্যাকজেসমূহ;: ডাক্তার দেখাও. প্যাকজেসমূহ | ডাক্তার দেখাও 2021 [Online]. Available, https://www.doctordekhao.com.bd/packages.php. [Accessed 23 May 2021].
[28] "Doctor List" [Online] Available, https://sebaghar.com/doctor_list. [Accessed 23 May 2021].
[29] Telehealth Index: 2019 Consumer Survey - American Well. 2021 [Online]. Available, https://static.americanwell.com/app/uploads/2019/07/American-Well-Telehealth-Index-2019-Consumer-Survey-eBook2.pdf. [Accessed 23 May 2021].
[30] Rennert-May E, Leal J, Thanh NX, Lang E, Dowling S, Manns B, Wasylak T, Ronksley PE. The impact of COVID-19 on hospital admissions and emergency department visits: a population-based study. PLoS One 2021;16(6).
[31] Birkmeyer JD, Barnato A, Birkmeyer N, Bessler R, Skinner J. The impact of the COVID-19 pandemic on hospital admissions in the United States. Health Aff 2020; 39(11):2010–7.
[32] Hasan ATMH, Das SC, Islam MS, Mansur M, Shawon MSR, Hassan R, Chowdhury MSJH, Mondal MBA, Mohammad QD. Impact of COVID-19 on hospital admission of acute stroke patients in Bangladesh. PLoS One 2021;16(1).
[33] Koonin LM, Hoots B, Tsang CA, Leroy Z, Farris K, Jolly B, Antall P, McCabe B, Zelis CBR, Tong I, Harris AM. Trends in the use of telehealth during the emergence of the COVID-19 pandemic — United States, January–March 2020. MMWR. Morbidity and Mortality Weekly Report 2020;69(43):1595–9.
[34] Bestsennyy O, Gilbert G, Harris A, Rost J. Telehealth: a quarter-trillion-dollar post-covid-19 reality? [Online]. Available McKinsey & Company, 22-Jul-2021 2021 [Accessed: 12-Oct-2021]. www.emarketer.com/content/us-telemedicine-users-will-surpass-40-million-this-year, https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality. [Accessed 23 May 2021].
[35] Dash S, Aarthy R, Mohan V. Telemedicine during COVID-19 in India—a new policy and its challenges. J Publ Health Pol 2021;42(3):501–9.
[36] Telemedicine during COVID-19: benefits, limitations, burdens, adaptation. Healthcare IT News 2020. 19-Mar-2020. [Online]. Available, https://www.healthcareitnews.com/news/telemedicine-during-covid-19-benefits-limitations-burdens-adaptation. [Accessed 23 May 2021].
[37] Leung R, Guo H, Pan X. Social media users' perception of telemedicine and mHealth in China: exploratory study. JMIR mHealth and uHealth 2018;6(9).
[38] Li Y, Zhang K. Using social media for telemedicine during the COVID-19 epidemic. Am J Emerg Med 2020.
[39] Oneill P, Shandro B, Poullis A. Patient perspectives on social-media-delivered telemedicine for inflammatory bowel disease. Future Healthc J 2020;7(3):241–4.
[40] Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. P & T: a peer-reviewed journal for formulary management 2014;39(5): 356–64.
[41] Islam MN, Karim MM, Inan TT, Islam AKMN. Investigating usability of mobile health applications in Bangladesh. BMC Med Inf Decis Making 2020;20(1).
[42] Telemedicine Service [Online]. Available, https://dghs.gov.bd/index.php/en/publications/84-english-root/ehealth-eservice/490-telemedicine-service. [Accessed 23 May 2021].
[43] Ramaswamy A, Yu M, Drangsholt S, Ng E, Culligan PJ, Schlegel PN, Hu JC. Patient Satisfaction With Telemedicine During the COVID-19 Pandemic: Retrospective Cohort Study (Preprint). 2020.
[44] Andrews E, Berghofer K, Long J, Prescott A, Caboral-Stevens M. Satisfaction with the use of telehealth during COVID-19: an integrative review. Int J Nurs Stud Adv 2020;2:100008.
[45] 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 Manag 2020;36(1):4–12.
[46] Yen Y-F, Tsai Y-F, Su VY-F, Chan S-Y, Yu W-R, Ho H, Hou C-M, Chen C-C, Woung L-C, Huang S-J. Use and cost-effectiveness of a telehealth service at a centralized COVID-19 quarantine center in Taiwan: cohort study. J Med Internet Res 2020;22 (12).
[47] Snoswell CL, Taylor ML, Comans TA, Smith AC, Gray LC, Caffery LJ. Determining if telehealth can reduce health system costs: scoping review. J Med Internet Res 2020;22(10).
[48] Zeltzer D, Einav L, Rashba J, Balicer R. The impact of increased access to telemedicine. Nat Bur Econ Res 2021.
[49] Ashwood JS, Mehrotra A, Cowling D, Uscher-Pines L. Direct-To-Consumer telehealth may increase access to care but does not decrease spending. Health Aff 2017;36(3):485–91.
[50] Prodhan UK, Rahman MZ, Jahan I. A survey on the telemedicine in Bangladesh. 2016 Int. Conf. Comput. Commun. Autom. (ICCCA) 2016.
[51] Kwakernaak J, Eekhof JAH, Waal MWMD, Barenbrug EAM, Chavannes NH. Patients' use of the internet to find reliable medical information about minor ailments: vignette-based experimental study. J Med Internet Res 2019;21(11).
[52] M. A. Gass, report"Risks and Benefits of Self-Diagnosis Using the Internet," Thesis. Salem State University, May-2016.
[53] Jutel A. Self-diagnosis: a discursive systematic review of the medical literature. 2010.
[54] Hochberg I, Allon R, Yom-Tov E. Assessment of the frequency of online searches for symptoms before diagnosis: analysis of archival data. J Med Internet Res 2020;22 (3).
[55] Hjelm NM. Benefits and drawbacks of telemedicine. J Telemed Telecare 2005;11 (2):60–70.
[56] 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 Manag 2020;36(1):4–12.
[57] Access to information (a2i) programme. Bangladesh national ICT household survey 2021 [Online]. Available, https://1e8q3q16vyc81g8l3h3md6q5f5e-wpengine.netdna-ssl.com/wp-content/uploads/2020/05/Bangladesh-National-ICT-Household-Survey.pdf. [Accessed 23 May 2021].
[58] Zemencuk JK, Hayward RA, Skarupski KA, Katz SJ. "Patients' desires and expectations for medical care: a challenge to improving patient satisfaction. Am J Med Qual 1999;14(1):21–7.
[59] Nessa A, Ameen MA, Ullah S, Kwak KS. Applicability of telemedicine in Bangladesh: current status and future prospects. 2008 Third Int Conf Convergence Hybrid Inf Technol 2008.
[60] Mahmud SZ, Amin MS, Tarafder MA, Hossain SM. Measurement of oral health literacy level among Bangladeshi adults seeking dental care and its relationship with socio-demographic characteristics. Anwer Khan Mod Med Coll J 2017;7(1): 34–9.