

# Telemedicine in COVID-19 era

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## ABSTRACT

**Background:** COVID-19 pandemic has set many things to new normal. Telemedicine, in its modern form, started in the 1960s. In this COVID era of isolation, lockdown and quarantine, telemedicine has emerged as an essential way to seek medical consultation. This study was designed to explore the practical utility of telemedicine.

**Methods:** This was an observational study of real-life scenario. The data were collected from prescriptions of single, home-based, specialist clinical practice set-up. It was over a period of 26 days in the month of August 2020. The liking or disliking or preference of telemedicine was asked by the physician and was recorded. Emergency cases were not entertained. Repeat visit cases were not included in statistical analysis. The data were analyzed by SPSS 23.

**Results:** A total of 453 cases were analysed. There were 40 COVID-19 cases and 413 non-COVID cases. COVID and non-COVID cases were analysed in different account. Thirty (75%) COVID-19 cases were RT-PCR positive; asymptomatic (2, 5%), influenza-like illness (ILI) (16, 40%) and pneumonia (22, 55%). Thirty one (77.5%) were diabetic, 19 (47.%) had hypertension, 4 (10%) had bronchial asthma. Twenty four (60%) cases were treated with regimen following national guideline (dexa+antibiotic+enoxaparine). Non-COVID cases were with chronic diseases; diabetes mellitus (81.6%), hypertension (67.1%), bronchial asthma (9.2%), hypothyroidism (12.6%). Nearly half (45.8%) were insulin user. Among the respondents, 8.4% disliked service of telemedicine, 91.6% supported it but 41.9% expressed the wisdom of face to face consultation. Over half (51.8%) urged not to abandon it.

**Conclusion:** Telemedicine may be a useful way of medical consultation where needed and indicated.

**Key words:** coronavirus disease 2019 (COVID-19), telemedicine, usefulness.

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## INTRODUCTION

Telemedicine involves the use of electronic communications to enable Registered Medical Doctors to consult patients at a distant place. It helps to share individual patient's medical information with other peer or specialist for the purpose of improving patient care.

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The concept of using some type of communication for medical purposes roots in human history. From the Aboriginal peoples of Australia, who were using "message sticks" as a tool for delivering information pertaining to tribal gatherings, diseases and deaths. African tribes used smoke signals to send alarming sign for a disease outbreak. Europeans used heliograph or bonfires for transmitting information about bubonic plague. All were applying some methods of long-distance communication for a health-related purpose. The discovery of telegram, telephone, radio; all revolutionised this communication. The NASA scientists' endeavors for developing unprecedented telemonitoring and telecommunication systems later became the basis for modern telehealth technologies.<sup>1</sup> The first operational telecommunicating system was launched in Boston in 1968, linking a medical station

at airport to a general hospital. Ever since the telemedicine and telemonitoring have been emerging concepts and widely used around the world. Telemedicine practices began in Bangladesh through the Center for Rehabilitation of Paralyzed (CRP) with the funding of the Swinfen Charitable Trust of UK in 1999.<sup>2,3</sup> The information may be used for diagnosis, therapy, follow-up and/or education. It may include any of the following: 1. Patient medical records 2. Medical images 3. Live two-way audio and video consultation 4. Output data from medical devices and sound and video files. Use of electronic systems incorporate network and software security protocols to protect the confidentiality of patient identification and imaging data and include measures to safeguard the data and to ensure its integrity against intentional or unintentional corruption.

Remote telemonitoring systems have been designed as a response to the new needs of home care for patients with acute as well as chronic diseases. It also has the potential to ensure appropriate monitoring and treatment of patients as well as reducing the healthcare costs. It became an essential tool to health delivery during disasters. It is playing an unique role in the COVID-19 pandemic. Despite the promising results of telemonitoring systems regarding patient management and healthcare costs reduction, usage of this innovative technology is not as widespread as we would expect. Today the emerging advances of information technology, the advent of internet and the growing trend of peoples' access to it and the challenges facing the healthcare systems are all contributing to the growth of this field of science and engineering. The aim was to have the idea of the type of patients seeking and benefitted with this service of telemedicine.

## METHODS

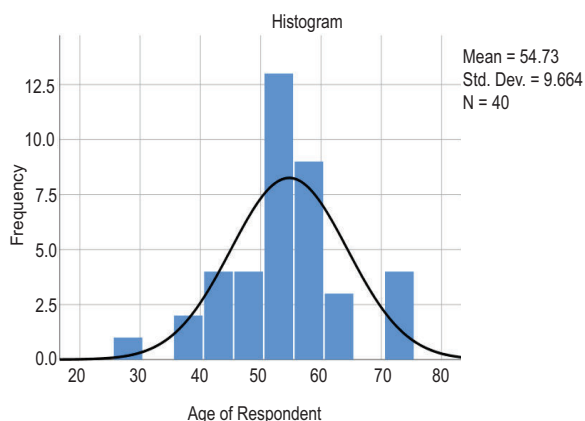
All data were collected from written (given) prescription by the specialist. It was a single centre, lone specialists of internal medicine and diabetology. Diagnosis, investigation reports were all exactly what was written there. Data were collected and screened as COVID-19 and non-COVID cases. Additionally, individual patients were asked during discussion about their liking or disliking about this service of telemedicine. The reason for variation was explored with semi-direct questioning to each patient. Their opinion was tabulated in result sheet. These all were compiled and arranged with pre-conceived way to see a real-life picture of an internist practice during the COVID-19 pandemic. Only one visit during the period was included. Only chronic and non-emergency acute cases were included. Data of revisit cases were excluded to avoid calculation errors.

## RESULTS

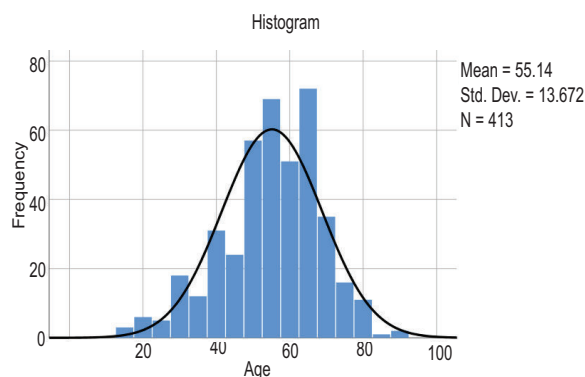
Total respondents were 453, including 40 COVID-19 patients and 413 non-COVID patients. Mean age of COVID-19 patients was 54.3 years and was slightly lower than non-COVID patients (Table I). Age distribution of COVID-19 and non-COVID patients are shown in Figures 1 and 2 respectively. Females outnumbered males and majority had co-morbidities including diabetes mellitus, hypertension and both (54%) (Table I). We got patients with multiple risk factor of atherosclerotic cardiovascular diseases (ASCVD) and complications viz ischaemic heart disease (IHD) (9.2%), chronic kidney disease (CKD) (15%), stroke (3.1%), diabetic peripheral neuropathy (DPN) (7.7%). There were different types of anxiety disorders including generalized anxiety disorders and irritable bowel syndrome, rheumatological diseases, infections etc. This other category comprised 51.6%.

**Table I** Co-morbidities among the respondents (N=453)

Characteristics	COVID patients (N=40)	Non-COVID patients (413)
Mean age (years)	54.3	55.1
Male: female	22 (55%): 18 (45%)	137 (33.2%): 276 (66.8%)
Diabetes mellitus	31 (77.5%)	337 (81.6%)
Insulin users	-	189/337
Hypertension	19 (47.5%)	277 (67.1%)
Hypothyroidism	-	52 (12.6%)
Bronchial asthma	4 (10%)	38 (9.2%)
Chronic kidney disease	-	62 (15%)
Others	-	213 (51.6%)



**Figure 1** Age distribution of COVID-19 patients



**Figure 2** Age distribution of non-COVID patients

In the COVID-19 group (N=40), 22 (55%) had pneumonia, 16 (40%) had influenza like illness (ILI) and 2 (5%) were asymptomatic (Table II). Thirty (75%) were RT-PCR positive for corona virus and 17 (42.5%) had positive findings on chest radiograph or high resolution computed tomography (HRCT) scan of chest. Seven (17.5%) patients were advised for hospitalization. Twenty four (60%) patients were treated according national guideline i.e. a regimen containing enoxaprine, dexamethasone and broad spectrum antibiotics.

**Table II** Spectrum of COVID-19 cases (N=40)

	Frequency	Percentage
<b>Disease spectrum</b>		
Asymptomatic	2	5.0
Influenza like illness	16	40.0
Pneumonia	22	55.0
<b>Basis of diagnosis</b>		
Positive RT-PCR	30	75
Positive imaging	17	42.5
<b>Treatment</b>		
Symptomatic	16	40
Dexamethason+Enoxaprine +Antibiotic	24	60
<b>Hospitalisation</b>	7	17.5

Among our respondent, 8.4% disliked service of telemedicine, 91.6% supported it but 41.9% preferred face to face consultation to telemedicine consultation. Over half (51.8%) urged not to abandon it (Table III).

**Table III** Respondents who prefer telemedicine services (N=453)

	Frequency	Percentage
Prefer	415	91.6
Do not prefer/(afraid)	38	8.4
Like to continue telemedicine services	241	58.1
Prefer face to face	174	41.9

**DISCUSSION**

In a very real sense, the spread of COVID-19 is a product of the digital and technological revolution that has transformed our world over the past century.<sup>4</sup> Unlike the “Spanish flu” of 1918, which became an international epidemic over the course of a year, COVID-19 has spread to every inhabitable continent within weeks, outpacing our health system’s ability to test, track, and contain people with suspected infection. This care structure contributes to the spread of the virus to uninfected patients who are seeking evaluation. Vulnerable populations such as patients with multiple chronic conditions or immunosuppression will face the difficult choice between risking iatrogenic COVID-19 exposure during a clinician visit and postponing needed care. Hospital-at-home care will be an important option for otherwise stable patients with newly diagnosed SARS-CoV-2 infections and for early discharge of patients admitted to hospitals. Another new category of service is oversight of persons under investigation in home quarantine. Physicians and health systems may need to track large populations of patients on a daily basis.

Over a period of three weeks 453 patients consulted. It may not be a big number but encouraging. It is good that during this unprecedented pandemic, during this time of different odds of communication, people could reach and get health care services. It was because the synchronous and asynchronous method of telemedicine was available and in process though in a limited extent from before. This is the benefit of advocacy by government and private sector and different media. The devices specially the smart phone for video chat is not within the affordability of a large group of people. Electricity has covered larger part of country, WiFi is not widespread available though the internet user has been increased three times to that of 2012 (30.2 to 87.6 million).<sup>5</sup> The biggest objection is the choice of the service seeker. It will take time of our people to become acquainted and habituated to adapt to digital health. The country currently has only 6 doctors for every 10,000 citizens.<sup>5</sup> This is extremely problematic because about 64% of the population resides in rural areas and thus have to travel very long distances for access to healthcare services. Moreover, due to this shortage, people are facing very long queues at healthcare facilities and getting very little time for each appointment. In India, after having the guideline of telemedicine by Indian ministry of health, digital health has been witnessing the surge since the beginning of March. The teleconsultations have been growing at an average of over 100 percent week-on-week. Also, there is almost 50 percent increase in the number of doctors joining it. The new guidelines have given authenticity and confidence to doctors to get on to the telemedicine consultation. The American Hospital Association (AHA) survey report published in 2016 stated that around 67% of U.S. hospitals connect with consulting practitioners and patients at a distance using video and other communication technology. So, telemedicine is a system to grow and to become popular. Moreover, many physician and healthworker throughout globe died simply because of direct consultation and exposure to the patients. It demands the introduction of telemedicine in pandemic like COVID-19. The global telemedicine market has been growing rapidly for the past few years and promises future growth according to multiple industry estimates with an estimated CAGR (Compound Annual Growth Rate) of about 15.1% upto 2027.

This retrospective prescription analysis showed mean age of non COVID-19 patient was 55.14 years. There were patients at their 80s also. More patients were at above sixties than of less than 40 years of age. The female patients were double the number of males. It clears the limitation, movement of females due to social reason and the tendency of inertia of them. We had 413 chronic cases, mostly NCDs. Literature support the services of chronic cases through telemedicine and its effectiveness in treatment specially follow up. The results from studies involving patients with diabetes indicated a trend toward patients with home telemonitoring achieving better glycemic control. In most trials in which patients with asthma were enrolled, results showed significant improvements in patients' peak expiratory flows, significant reductions in the symptoms associated with this illness and improvements in perceived quality of life. Virtually all studies involving patients with hypertension demonstrated the ability of home telemonitoring to reduce systolic and/or diastolic blood pressure. Lastly, due to the equivocal nature of current findings of home telemonitoring involving patients with heart failure, larger trials are still needed to confirm the clinical effects of this technology for these patients.

Utility of telemedicine has been studied on chronic pulmonary conditions such as pulmonary transplant, asthma and COPD. These trials have demonstrated ability of telemonitoring to identify early changes in patients conditions, thus supporting immediate intervention and avoiding exacerbation. We had 81.6% diabetic patients with 45.8% insulin users. High percentage was due to the speciality of the consultant physician. It may not represent the whole community but it shows the awareness and eagerness of the patients for their follow up.

Latest reviews on usage of telemonitoring for management of diabetes have revealed positive improvement in HbA1c level in type 1 and type 2 diabetic patients, improved glycemic control in gestational diabetes and effective screening and monitoring of diabetic retinopathy and also high acceptance among participants.<sup>6</sup> Telemonitoring has been shown to be able to significantly improve the treatment outcomes of many chronic diseases,<sup>7</sup> including pulmonary disorders, diabetes, hypertension, and cardiovascular diseases (CVD). Telecardiology can

also help in first detection of new atrial fibrillation (A.F), home management of chronic A.F and home monitoring of cardiac implantable devices is feasible and associated with an early detection of medical and technical events.<sup>8,9</sup> The increasing burden of CVD necessitates the investigation of effectiveness of telemonitoring in CVD. Telecardiology applications can be useful in primary and secondary prevention of cardiovascular diseases, diagnosis of acute myocardial infarction, rehabilitation after cardiac events, management of chronic heart failure, arrhythmias and management of cardiac implantable electronic devices.

Like telecardiology, telemedicine can help in early detection and shorten the delay to treatment of ischemic stroke. High stroke score are related to delayed door-to-needle time (DTN).<sup>10</sup> Thus trials have done to study effectiveness of telemonitoring to reduce DTN. Tele stroke uses video conference (VC) technology to allow off-site experts to provide stroke thrombolysis decision support to less experienced front line clinicians. We have large group patient of cardiovascular and diabetes mellitus. Most of them with chronic disease and needed follow up.<sup>7</sup> Some of patients were with non-emergency acute infection (viz UTI). We referred emergency cases to different centre. A group of patients have other diseases. These were disorders of daily life in the form different type of anxiety disorders, rheumatological disease, infections etc. Some of them had aforementioned diseases also.

Queries regarding fever, cough, cold, sore throat and body ache have increased by 200 percent in India after ministry of health have announced the guideline for telemedicine consultation. Death of many health workers mostly doctors because of undue exposure to corona patient eases the decision making process for HCP mobilised from differing fields of expertise to combat COVID 19 as it is a simple checkbox forma.<sup>11</sup> Since no stationary will be used and examining doctor will not handle the device nor the patient encounters it, risk of fomite transmission is minimised. It is more than a technological or communication challenge; it is a rather bridge constructed over troubled water.

COVID-19 is a new and potentially serious coronaviral infection. The World Health Organization (WHO) has declared the COVID-19 outbreak to be a public health emergency of international concern. Due to the COVID-19 pandemic, people are reluctant to visit doctors and

telemedicine in now the new normal for both urban as well as rural populations. We had 40 patients of COVID-19 during this short period of home practice. Male were 55% and majority was at 60s. The median age of patients infected with SARS-CoV-2 is in the range of 47–56 years, men comprised more than half of the cases. These statistics coincide well with world incidence of COVID-19.<sup>12</sup> Though natural history of covid is around 80% come with ILI, our patient group showed 55% with pneumonia and 40% ILI. This may be defect of reporting. Thinking of simple seasonal cold many are reluctant to consult a doctor where there is an involvement of smartphone, WiFi and consultation fee. This incidence may be reverse with free consultation and direct physician/out door visit. Peoples with diabetes were more affected (31, 77.5%). World wide data suggests peoples with diabetes haven suffering more with COVID-19. Severe diseases is also more with them. The problem people face with diabetes is primarily a problem of worse outcomes, not greater chance of contracting the virus. People with diabetes have much higher rates of serious complications and death than people without diabetes and generally we believe that the more health conditions someone has (for example, diabetes and heart disease), the higher their chance of getting serious complications from COVID-19. Older people are also at higher risk. Diabetes and hypertension are the most prevalent comorbidities with COVID-19. It is well known that people with moderate to severe asthma may be at higher risk of getting very sick from COVID-19. COVID-19 can affect your nose, throat, lungs (respiratory tract), cause an asthma attack and possibly lead to pneumonia and acute respiratory disease. COVID-19 pandemic is scary for all people, but for those with asthma there is great fear that they will have a worse outcome or be more likely to get SARS-CoV-2. It is important to know that currently there is no evidence of increased infection rates in those with asthma. And although the Centers for Disease Control and Prevention states that patients with moderate-severe asthma could be at greater risk for more severe disease, there are no published data to support this determination at this time. There has been one report suggesting that asthma may increase the risk of hospitalization from COVID-19 in 18-49 year old adults; however, this is based on a small number of patients.<sup>13</sup> And in the opposite direction are data from New York where asthma was under-represented (so protective) in those who died

from COVID-19.<sup>14</sup> It is important to remember we are dealing with an evolving pandemic and new information could change the situation in the future. It is reported that many ‘suspected’ cases with typical clinical characteristics of COVID-19 and identical specific CT images were not diagnosed.<sup>15</sup> Globally, most effort so far has been invested in turnaround times and low test sensitivity (ie, false negatives); one systematic review reported false-negative rates of between 2% and 33% in repeat sample testing.<sup>16</sup> RT-PCR tests to detect SARS-CoV-2 RNA are the operational gold standard for detecting COVID-19 disease in clinical practice. RT-PCR assays in the UK have analytical sensitivity and specificity of greater than 95%, but no single gold standard assay exists.<sup>17</sup> Diagnostic or operational performance of swab tests in the real world might differ substantially from the analytical sensitivity and specificity.<sup>18</sup> Thus, a negative result does not exclude the possibility of COVID-19 infection and should not be used as the only criterion for treatment or patient management decisions.<sup>19</sup> It seems that combination of real-time RT-PCR and clinical features facilitates management of SARS-CoV-2 outbreak.<sup>20</sup> A chest radiograph is not recommended as a first-line diagnostic imaging modality for COVID-19 infection due to its lack of sensitivity, especially in the early stages of infection.<sup>21</sup> Commonest finding in chest x-ray is bilateral pneumonia. We took it as a criteria to start treatment regimen.<sup>25</sup> In February 2020, Chinese studies revealed that chest CT achieved a higher sensitivity for the diagnosis of COVID-19 compared with initial RT-PCR tests of pharyngeal swab samples.<sup>22,23</sup> Subsequently, the National Health Commission of China briefly accepted chest CT findings of viral pneumonia as diagnostic of COVID-19 infection.

The typical appearance of COVID-19 on chest CT consists of multi-lobar, bilateral, predominantly lower lung zone, rounded ground-glass opacities, with or without consolidation, in a predominantly peripheral distribution. A “reversed halo” pattern and crazy paving (septal thickening) can also be seen. However, such findings are nonspecific. Hence RT-PCR is gold standard for confirmation though HRCT chest as sensitive as RT-PCR. COVID-19-related chest CT abnormalities are more likely to appear after symptom onset, though they may also precede clinical symptoms.

It seems meanwhile, pure ground-glass opacities were the only abnormalities seen prior to symptom onset.<sup>24</sup> Sixty percent of our patients got a regimen following national guide line.<sup>25</sup> It contained dexamethasone, enoxaprine and antibiotics. All of them have pneumonia in imaging studies.<sup>25,26</sup> All diabetic and or hypertensive patients got enoxaprine. We did not use any anti viral drugs. Few patients had to be hospitalized as they could not be maintained with home oxygenation. There were no reported casualty in our series. This may be because number of patients were less. Only mild pneumonia and ILI cases were delt here. Morovere, there were cases with post covid follow up here.

Every patients were asked about there preference of telemedicine service. This was like a semidirect way of exploring the FAQ of telemedicine. We tried to explore the reason. Majority liked it but they were more in favour of direct face to face consultation with physicians. Among our respondant nearly one-tenth dislike service of telemedicine, majority supported it but two-fifths preferred face to face consultation to telemedicine consultation. Over half urged not to abandone it. Poor connections, multiple log-ins and confusing downloads are some of the most common complaints from patients new to telemedicine. It is common to see telemedicine technology that promises to do it all, but proves to be overwhelming for patients who may be new to applications and video technology.

### Conclusion

Total 453 patients consulted. Chronic case 413 and 40 acute case. Chronic cases were .Diabetse mellitus, Hypertension, Bronhcial asthma, hypothyroidism and their complication..They were in diar need of follow up and treatment .Acute cases were all covid-19 patients.They were in need of diagnosis and treatment.This was very difficult in the situation of pandemic with lock down, isolation and quarantine. Moreover there was always a chance of transmission of the SARS-CoV- 2 infection.Among respondents 92% favoured telemedicineand majority suggested to continue the temedicine consultaion even when the pandemic is over.Telemedicne may a be an additional and useful method of medical consultation .

**Authors’ contribution:** SNN collected and plotted data. MR analyzed data. KNU planned the study, drafted the manuscript. All authors read and approved final manuscript.

**Conflicts of interest:** Nothin to declare.

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