

# To Demonstrate the Efficacy and Competency of Telemedicine in the Treatment of COVID-19 Home Isolated Patients

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## ABSTRACT

### BACKGROUND

The global wide adoption of telemedicine provided a considerable and long-lasting influence in healthcare but was not firmly established in a catastrophic situation like the COVID-19 pandemic. Hence, the purpose of this study was to enlighten the efficacy of telemedicine and its competence in treating mild COVID-19 patients in a home isolation setup.

### METHODS

200 patients were enrolled for the COVID Tele home Care Services initiated by the Department of Respiratory Medicine, Sri Ramachandra Institute of Higher Education and Research Institute (SRIHER), Chennai, India from August 2020-November 2020. All the enrolled patients were RT-PCR confirmed COVID 19 with mild severity and were virtually telemonitored and treated by video and audio calls. Measures such as age, sex, present clinical complaints, existing co-morbidities, blood investigations, oxygen saturation (Spo<sub>2</sub>), and radiological investigations were detailed at the time of enrolment and discharge. Statistical analyses with SPSS version 19 were executed to determine the p-value significance ( $P < 0.05$ ).

### RESULTS

Among the 200 patients enrolled for this study, 167 patients were symptomatic and 33 were asymptomatic. 77 % of the patients had symptom resolution within 1 week and the remaining 23 % were monitored for up to 14 days. Out of 195 patients discharged from home care, only 5 required hospitalization because of persisting symptoms like fever, vomiting, deranged blood parameters and desaturation.

### CONCLUSIONS

Telemonitoring of mild COVID-19 patients under a specialist team including pulmonologists, nursing, paramedics, nutritionist, and psychologist is found to be a safe, reliable, and competent model in such pandemics.

### KEY WORDS

COVID-19, Healthcare System, Pandemic, Telemedicine, Telemonitoring.

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## BACKGROUND

The medical benefit of Information and Communication Technology (ICT) consents to monitor the patient made it possible from a distance through telemonitoring. [1] Telemonitoring is the most encouraging technology for chronic diseases like cardiopulmonary illness, asthma, arrhythmia, heart failure etc. It even permits the monitoring of the fetal heart rate, cardiopulmonary functions of infants, coagulation profiles and both physical and mental activity levels of the elderly population through intelligent home monitoring devices.[1] Medical clinics, hospitals, and ambulances are well equipped with systems connected to treating hospitals. It delivers intense support towards better reduction of chronic illness complications, provides excellent follow-up of patients without utilizing hospital beds as well as saves patient travel time apart from the overall cost. Hence, it is proved to be cost-effective and offers home health care services for the elderly population. Telemonitoring real-time facility provides robust treatment for patients who need medical emergency and keep the emergency crew in a well-planned state. The disadvantages of telemonitoring are the development comprises system cost and physician licensing. In the year 2005, Meystre S et al. predicted the possibility of virtual reality and also promised the development and application of nanotechnology in telemonitoring services by increasing its efficiency in the near future.[2] The use of telehealth technology is both patient-centred and protects patients as well as physicians from the 21<sup>st</sup>-century approach and acts as a tool for both screening and diagnostic purposes.[3-4]

Telemedicine was originally pronounced to provide medical assistance in rural areas or in areas where medical access was limited and was primarily projected for the management of chronic diseases and in an emergency situation.[5-6]

The onset of pandemics or epidemics worldwide over the years had led to the increased employment of these digital technology strategies and in turn, supported the use of telemedicine during different stages of infections more recurrently like in SARS epidemics (2003) and later in MERS-CoV (2013).[7] The World Health Organization (WHO) declared a pandemic state on March 11th 2020 due to COVID-19 (SARS-CoV-2) virus. It led to lockdown globally having a higher impact on people's life both economically and in health status due to which health care organizations deal with the management of both COVID and routine non-COVID patients simultaneously and remains a large burden for them. Hence, potent usage of telemedicine has been reported in industrialized countries, especially in USA, UK and China.[8-10]

Even common phone interviews have been documented but there are no standard guidelines available nationally and internationally for routine use and in urgent circumstances. But still, telemedicine offers protective interaction between the clinicians and patients in spite of major lockdown and the lack of effective vaccine and treatment strategies.[11] According to previous literature, social distancing had stimulated three important e-health applications during the COVID-19 pandemic situation.[12,13]

Patients who are at risk of infections (chronic, autoimmune or immunosuppressant diseases) with higher-level magnitude could prevent risk factor exposure through telemonitoring facilities when clinical facilities are restricted. On the other hand, new telephonic triages have been proposed which permit excellent screening services of SARS-CoV-2 case suspects and thereby reducing health care referrals significantly.

Definitive positive cases having no symptoms or with mild symptoms were followed up in COVID centres through telemonitoring services. But there are very limited literatures documented regarding the efficiency and competence of remote virtual telemonitoring in the treatment of COVID-19 patients. Henceforth, the purpose of this study was to enlighten the efficacy of telemedicine and its competence in treating mild covid-19 patients in-home care setup.

## METHODS

The current study plan was a cross-sectional cohort study performed on reverse transcription-polymerase chain reaction (RT-PCR) confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV- 2) infected patients who had enrolled for the COVID-19 telehome care services from August 2020 to November 2020. The study was initiated after obtaining the Institutional ethics committee clearance (CSP-MED/21/JUL/70/110) and informed consent from the patients. All the patients who had the mild covid-19 disease were recruited for the study and virtually telemonitored and treated by video and audio calls.

Among the study participants, patients who met all the inclusion criteria and underwent screening baseline investigations were enrolled for Home Care Telehealth Services, which is illustrated in Table 1.

### Disease Severity Categorization

We followed the AIIMS/ICMR COVID-19 NATIONAL TASK FORCE/JOINT MONITORING GROUP.

#### Mild

Upper respiratory tract symptoms and or fever without shortness of breath or hypoxia.

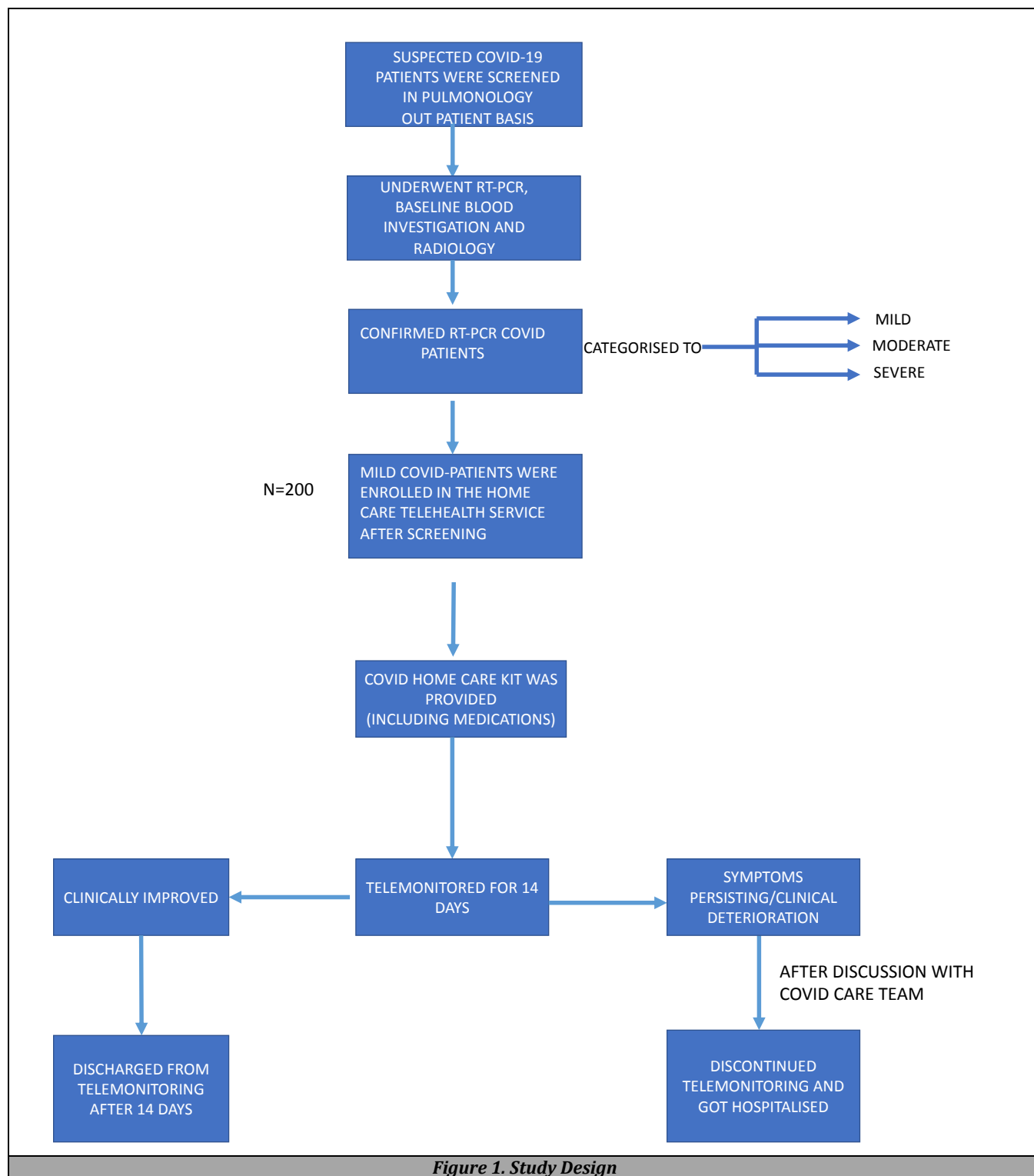
#### Moderate

Respiratory rate  $\geq 24$ /min, breathlessness. Spo2 – 90 % to  $\leq 93$  % on room air.

#### Severe

Respiratory rate  $\geq 30$ /min, breathlessness Spo2 < 90 % on room air.

The study design is illustrated in Figure 1.



**Figure 1. Study Design**

Selection of patients based on inclusion criteria.

#### Inclusion Criteria

- Mild COVID-19 patients with RT-PCR for SARS-COV-2 positive
- All patients with age more than 18 years were recruited directly
- Patients, less than 18 years of age were included after obtaining paediatrician fitness and parents' consent
- For antenatal mothers, obstetrician fitness was mandatory for enrolling in the study
- Patients should have blood parameters with normal limits

| Sl. No. | Parameters                           |
|---------|--------------------------------------|
| 1       | Complete Blood Count (CBC)           |
| 2       | Erythrocyte Sedimentation Rate (ESR) |
| 3       | C-Reactive proteins (CRP)            |
| 4       | Serum ferritin                       |
| 5       | Serum lactate dehydrogenase          |
| 6       | D-dimer                              |
| 7       | Glycated haemoglobin (HbA1c)         |

**Table 1. Baseline Blood Investigation**

Out of the enrolled study participants, patients were screened and rejected for study participation if at least one of the exclusion criteria was present, which included more than two abnormal or deranged blood parameters in basic blood investigations, moderate and severe COVID-19 patients. The exclusion criteria have been enlisted as follows

### Exclusion Criteria

- Moderate and Severe Covid-19 patients.
- Patients with more than two abnormal blood parameters

Once the patients satisfied the inclusion criteria, they were enrolled for the telemonitoring service and were provided with a COVID-19 care kit which consisted of monitoring devices such as a digital thermometer, pulse-oximeter and required medication for COVID-19 treatment. A 24 hours emergency uninterrupted helpline number was provided to each individual for the next 14 days. The treatment protocol for the next 14 days was given as shown below in Table 2.

| Treatment Protocol                                                                                            | Dosage      | Frequency              |
|---------------------------------------------------------------------------------------------------------------|-------------|------------------------|
| Tablet Vitamin C                                                                                              | 500 mg      | Twice daily for 5 days |
| Tablet Zinc                                                                                                   | 50 mg       | Once-daily for 2 weeks |
| Tablet Indomethacin (for fever patients if liver function and renal function tests were within normal limits) | 25mg        | Twice Daily for 5 days |
| Tablet Paracetamol (for fever if LFT and RFT were abnormal)                                                   | 500 mg      | SOS                    |
| MDI Budesonide (for wheezing)                                                                                 | 200 mcg     | Two puffs twice daily  |
| For persistent cough Syrup Zedex (Chlorpheniramine Maleate + Dextromethorphan Hydrobromide)                   | 5 ml        | Twice daily            |
| Tablet Montelukast + Levocetirizine (For nasal congestion)                                                    | 10 mg/ 5 mg | Once daily             |

**Table 2. Details of Patient's Treatment Regimen**

Telemonitoring service included monitoring of patient's oxygen saturation (Spo2) levels, temperature and pulse rate with a six hours interval in between by an authenticated staff nurse for the next 14 days. Clinicians communicated with the patients twice a day either through audio or video calls, during which patients presented their chief complaints to the clinicians and appropriate medical remedies were recommended by the clinicians. The clinical nutritionist was primarily responsible for observing the patient's comorbidities every week once and appropriate nutritional advice was provided. Among the enrolled patients, those with psychological issues such as anxiety were handled by the psychologist. Psychologists counselled such patients once in three days. Similarly, the respiratory therapist imparted special breathing sessions on diaphragmatic, deep breathing and incentive spirometry once in three days.

Bedside, patients were simulated virtually performed by the consultant, resident and staff nurse through an audio or video call during which patients presented their complaints and appropriate advice was provided to the patient. Apart from that, the vitals of the concerned patients was maintained by the health care team respectively which is shown in Figure 2.

| VIRTUAL ROUNDS SHEET           |                  |                               |
|--------------------------------|------------------|-------------------------------|
| PATIENT NAME:-                 |                  |                               |
| PATIENT ID:-                   |                  |                               |
| AGE/SEX                        |                  |                               |
| DATE OF ADMISSION              |                  |                               |
| DAY OF ROUNDS                  |                  |                               |
| VITALS-                        | PULSE RATE-SPO2- | RESPIRATORY RATE TEMPERATURE- |
| PATIENT COMPLAINTS:-           |                  |                               |
| ADVICE:-                       |                  |                               |
| DOCTOR ON CALL:-               |                  | NURSE ON CALL:-               |
| NUTRITIONIST ADVICE:-          |                  |                               |
| RESPIRATORY THERAPIST ADVICE:- |                  |                               |
| PSYCHOLOGIST ADVICE:-          |                  |                               |

**Figure 2. Virtual Rounds Sheet**

Out of the total enrolled patients, only 200 patients satisfied the inclusion and exclusion criteria. All the enrolled patients were RT-PCR confirmed COVID 19 with mild severity and were virtually telemonitored and treated by video and audio calls. Measures such as age, sex, present clinical complaints, existing co-morbidities, blood investigations, oxygen saturation (Spo2), and radiological investigations were detailed at the time of enrolment.

### Statistical Analysis

The above-mentioned parameters were collected for further analysis. Statistical analysis with Statistical Package for the Social Sciences (SPSS) version 21 was executed to determine the descriptive value for the continuous variable and an ANOVA test was performed to determine the p-value significance ( $P < 0.05$ ).

## RESULTS

The mean age of the total study participants registered for home care telehealth services for COVID-19 treatment with mild symptoms was 37.5 years ( $N=200$ ) and ranged from 16 to 63 years. There was no major difference observed between the male gender from the females with respect to the mean ages (38.9 versus 36.3) and was found to be statistically insignificant ( $P=0.18$ ). Out of the total study population, the predominant chief clinical feature identified was fever ( $n=101$ , 50.5%) followed by ( $n=56$ , 27.2%) myalgia, loss of taste and smell, and sore throat. Asymptomatic individuals were found to be least in percentage distribution ( $n=43$ , 22.3%) as illustrated in Figure 3.

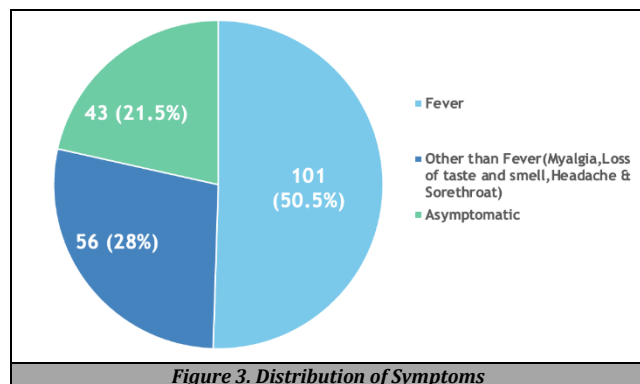


Figure 3. Distribution of Symptoms

A higher percentage of the entire population had an overall oxygen saturation (spo2) level of more than 97% to 98% (87.5%) on admission. The complete information is demonstrated in Figure 4.

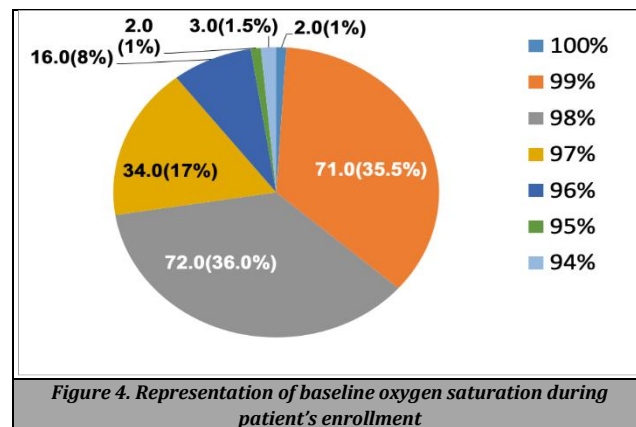


Figure 4. Representation of baseline oxygen saturation during patient's enrollment

With regard to comorbidities associated with the total study populations, almost diabetes mellitus and hypertension were frequently observed (n=14, 22.6 % versus n=13, 21 %) next to other related comorbid conditions (n=18, 29 %). To an extent, asthmatics (n=8, 12.9%) were found in the total study population followed by hypothyroidism (n=6, 9.7 %) and coronary artery disease (CAD, n=3, 4.8 %) associated with a negligible percentage of the population as stated and represented in Figure 5.

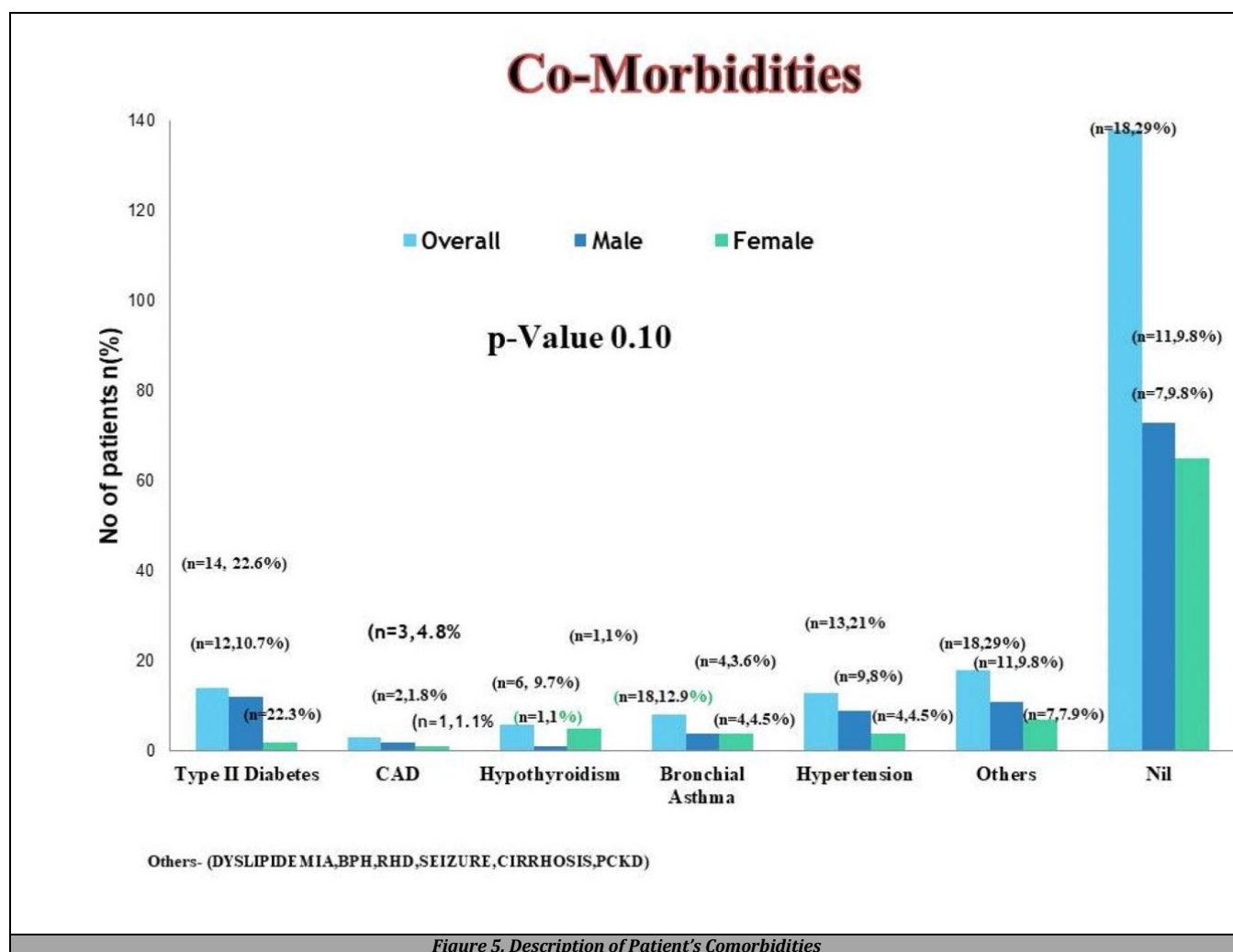


Figure 5. Description of Patient's Comorbidities

Routine basic investigation revealed eosinopenia (n=87, 43.5 %) followed by elevated ESR (n=75, 37.5 %), Anaemia (n=65, 32.5 %) with lymphopenia (n=52, 26 %), elevated CRP (n=50, 25 %) and higher levels of HbA1c (n=41, 20.5 %) with D-dimer elevation in 11.5 % (n=23) of the population is the reflection of the immunocompromised state in our complete study population. Figure 6 describes the overall basic blood investigation profiles as well as regard for gender differences.

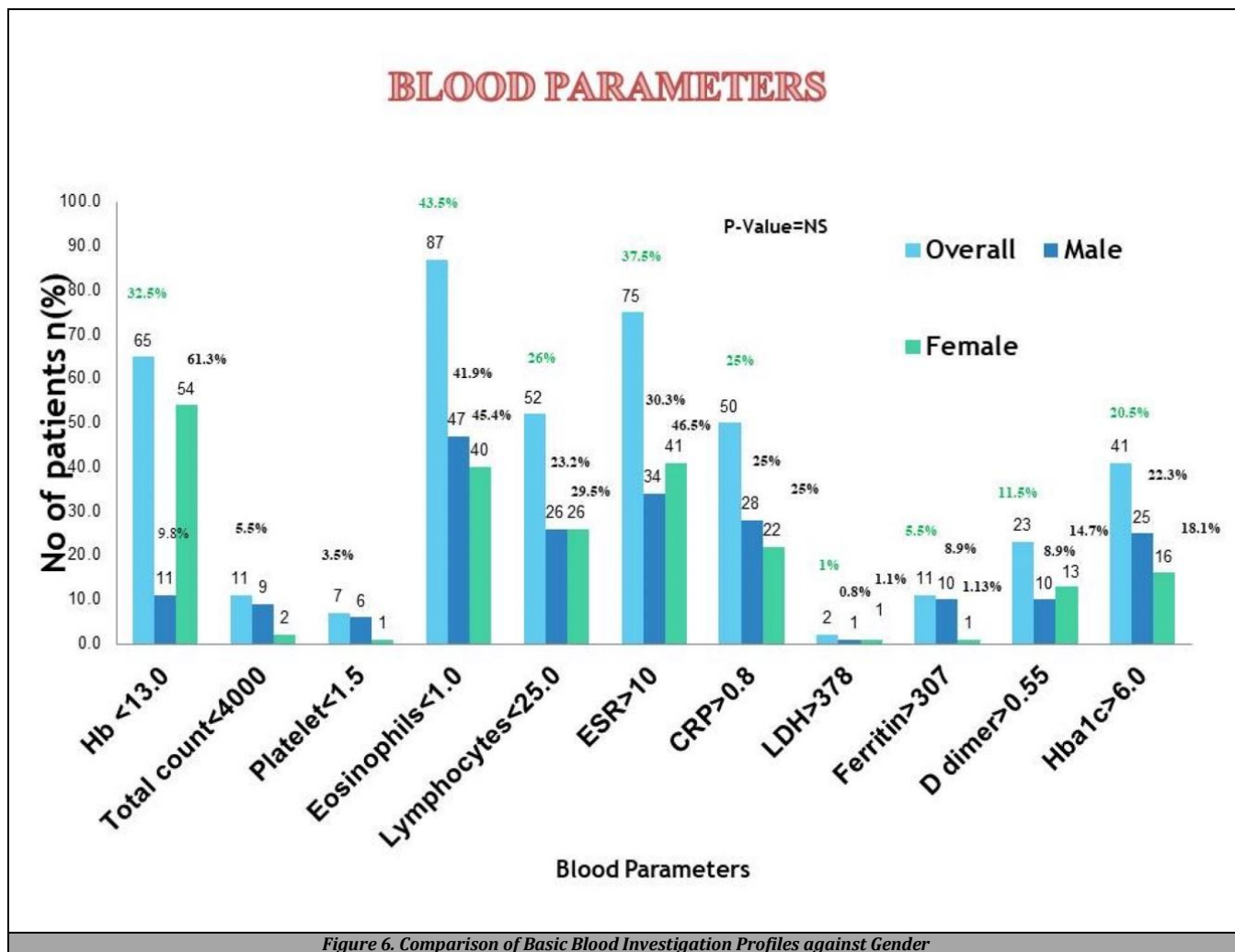


Figure 6. Comparison of Basic Blood Investigation Profiles against Gender

Radiological investigations such as CXR showed normal findings in the predominant population (n=170, 92.9 %) while the rest of the populations had radiological findings showing bilateral lower zone infiltrates. After 14 days of telemonitoring, the majority of the patients had an overall oxygen saturation level above 98 % as represented in figure 7.

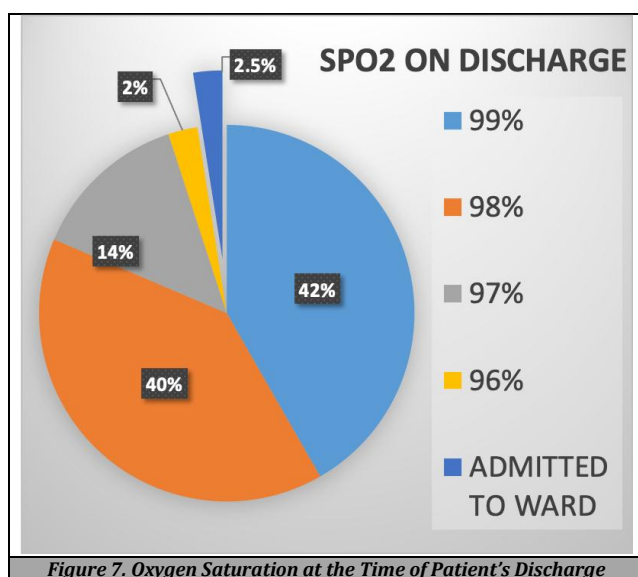


Figure 7. Oxygen Saturation at the Time of Patient's Discharge

Symptoms resolved in a higher percentage of the populations in less than one week (n=154, 77 %). Symptoms persisted for more than a week duration in 8 patients (n=8 4 %) whereas others remained asymptomatic throughout the

study (n=33, 16.5 %). A large number of patients had their oxygen saturation status improved on discharge. Only 3.5 % (n=5) of the patients got hospitalized due to persistent fever, vomiting and deranged blood parameters after discussing with the COVID CARE TEAM where the outcome of patients is shown in Figure 8.

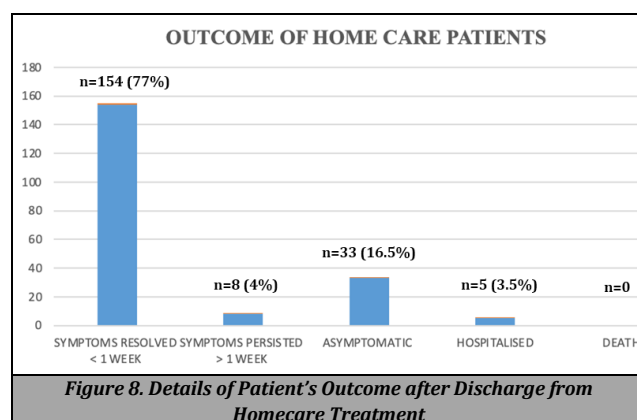


Figure 8. Details of Patient's Outcome after Discharge from Homecare Treatment

## DISCUSSION

Serrano KM et al. assessed the factors that had influenced the acceptance of telemedicine among adult patients by employing a quasi-experiment and studied a total of 248 patients using a structured questionnaire. The study concluded that adult patients tend to adopt telemedicine treatment irrespective of their disease complexity.<sup>[14]</sup> But in our study, we had included paediatric populations and they had shown a good rate of recovery with a good acceptance rate for telemedicine.

Recently, Chérrez-Ojeda I et al. reported a case of a 60-year-old female who intensely required medical attention for dyspnoea, fatigue and sleeping difficulty with reduced oxygen saturation health status. She was diagnosed as COVID-19 positive with severe symptoms and her CT scan report confirmed her diagnosis with findings of bilateral consolidation with ground-glass opacities. She recovered completely through teleconsultation.<sup>[15]</sup> Similarly, our original research report has also included patients with the age ranging from 16 to 63 years but in contrast, our patients had mild symptoms of COVID-19 and we successfully treated the patients through a telemedicine facility. The above report of Chérrez-Ojeda I et al. have proved the efficiency of treating even severe COVID-19 patients through teleconsultation like ours. Our study has reported the efficiency and the competence of treating COVID-19 patients on a larger scale of populations.

Galiero R et al. stressed the importance of employing telemedicine during the COVID-19 pandemic with a focus on diabetic retinopathy.<sup>[16]</sup> In similar, our research had also stressed the importance of telemedicine application during this COVID-19 pandemic by treating 200 COVID-19 patients through home care telehealth by employing telemedicine. The obtained results were found to be excellent in terms of recovery and safety.

Monaghesh E conducted a systemic review of evidence-based study to assess the telehealth during COVID-19 outbreak by retrieving literature from five different databases and finally, analyzed eight studies and concluded that telehealth has become a mandatory and prominent tool during the COVID-19 pandemic to protect both patients and healthcare providers.<sup>[17]</sup> Our paper has also highlighted the importance of telehealth along with its effectiveness and competence during the COVID-19 pandemic.

## CONCLUSIONS

The present study demonstrates that telemedicine including virtual telemonitoring services is a very effective tool while treating mild COVID-19 home isolated patients. Structured patient monitoring with scheduled patient calls and vitals monitoring and daily doctor calls have proven very effective in managing the milder form of this highly contagious COVID-19 disease. It also enables us to identify the time of progression from mild to moderate disease at a very early stage and transfer the patient to an appropriate higher health care facility for supportive care. This study proves that, telemonitoring of mild home isolated COVID-19 patients can be done effectively without compromising the quality of care

and also providing adequate psychological support which keeps the anxiety levels low in such patients. Telemonitoring of mild COVID-19 patients also reduces the stress on already overburdened hospitals and health care workers and also ensures bed availability for moderate to severe COVID-19 patients. We propose that in case of such pandemics a proper triaging of mild patients and providing them home isolation under telemonitoring services by a team of well-trained doctors, nurses, psychologists, paramedics and physiotherapists will be the best option for providing safe, reliable and competent care in future.

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