ORIGINAL ARTICLE

Efficacy of Telemedicine to Manage Heart Failure Patients during COVID-19 Lockdown

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ABSTRACT

Background and Objective: Congestive Heart failure (CHF) is an increasing clinical syndrome with frequent exacerbation requiring a very close follow-up to prevent hospitalization. Due to current lockdown situation related to coronavirus disease 2019 (COVID-19) pandemic, CHF patients suffered by having limited access to their physicians and therefore are more vulnerable and at higher risk for CHF exacerbations requiring CCU admission. There is no data so far in Pakistan using telemedicine to manage CHF patients. The present study aimed to use telemedicine to manage CHF patients at home, keeping them safe from COVID-19 in order to prevent exacerbation of CHF.

Methods: A descriptive study was carried out at Shalamar Hospital, Lahore. A total of 31 established CHF patients were enrolled to manage them at home via telemedicine after taking the approval from Institutional Review Board. Patients were followed via telemedicine every two weeks for a total period of 8 weeks. Data was analyzed in SPSS version 20. Mean with standard deviation was calculated for quantitative variables like age. Frequency and percentages were calculated for qualitative variables. For determining any significant difference between the stratified groups, the Chi-Square test was applied hence taking P-value ≤ 0.05 as significant.

Results: Among 31 patients, mean age was 54.4 ± 11.121 years. A total of 60% were males. Average Left Ventricle Ejection Fraction (LVEF) of 26.9% was seen. Patients were followed on defined CHF monitoring parameters including weight changes, new or worsening ankle edema or breathing difficulty. Patients were trained to record and report their daily vitals. A total of 14 patients reported CHF symptoms and 11patients required adjustment of diuretic dose with successful management. Only two patients ended up being admitted in Coronary Care Unit (CCU) for CHF exacerbation and at 8 weeks there was no significant change in the weight gain or renal functions as a result of medicine adjustment due to telemedicine.

Conclusion: Telemedicine during current lockdown related to COVID-19 pandemic is an effective strategy to manage CHF patients at home while keeping them safe from Corona virus infection.

KEYWORDS: COVID-19, Congestive Heart failure (CHF), Left ventricle ejection fraction, New York Heart Failure (NYHF) class.

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INTRODUCTION

Congestive Heart Failure (CHF) is an increasing clinical syndrome across the world with very high morbidity and mortality.[1] CHF incidence and prevalence continue to rise in underdeveloped countries due to worsening hypertension and ischemic heart disease resulting in heart failure syndrome.[2,3] In Southeast Asia the situation is no

different with increasing rise in the number of CHF patients.[4] In Pakistan, there is no definite data of CHF incidence or prevalence.

CHF patients are very difficult to manage and primary treatment aims are directed towards symptomatic relief and to prevent hospitalization for CHF exacerbations. In USA and Europe, specialized "heart failure clinics" have played a vital role managing these patients by frequent clinic visit usually every 2 to 3 weeks and at times every week depending upon patient's clinical status.[5,6] In addition, heart failure clinics also use telemedicine service for those CHF patients who are unable to visit clinic for one or the other reason.[7]

With current lockdown situation related to COVID-19 pandemic, we anticipated the difficulty our CHF patients were going to face, and therefore, decided to use telemedicine to manage them at home while keeping them safe from coronavirus exposure by frequent hospital/clinic visits.

Although, physicians, at times manage some of the patients over the phone for minor complaints, however, there is no authenticated experience of telemedicine use for managing patients in this society. In Europe and more specifically in USA, telemedicine practice is on the rise and has proven to be beneficial in certain scenarios.[8] We believe its importance has become even more useful during current COVID-19 pandemic related lockdown where routine medical access is almost non-existing and patients CHF may ended up in hospitals with exacerbation of their symptoms.

Shortly after the start of lockdown period, the authors planned to manage the established CHF patients via telemedicine to provide them maximum medical and psychological support.

METHODS

This is an observational study where 31 adult patients from the Department of Cardiology at Shalamar Hospital Lahore were followed-up in this telemedicine-based home management over 8 weeks period after taking the approval from Institutional Review Board. The established CHF patients for at least 6 months, the patients on diuretics, with at least 40 mg daily Lasix dose, patients having availability or willingness to arrange an automatic Blood Pressure (BP), pulse monitor and weighing scale at home, patients with at least one homecare personal involved in the patient's care and available at the time of telephonic interview with patient and the ones having the phone application of whatsapp available to share the results of vitals and lab data were all included in this study.

Patients and caregiver were briefed over the phone of planned telemedicine visit every 2 weeks or earlier if worsening of symptoms. All patients recorded baseline, BP, pulse, weight and presence of ankle swelling if any. Additionally, most recent electrolytes and serum creatinine levels were noted. Patients were given instructions to record daily one-time BP, pulse and weight and to send the information to cardiologist via whatsapp on their appointment day. Telemedicine visit appointments were arranged during afternoon between 3 – 5 pm for convenience of patients and cardiologists. Over 10 – 15 minutes telephonic interview with patients and with caregiver if patient not a good historian, history was taken for following information; change in breathing symptoms, swelling of ankles, difficulty of breathing especially lying down at night time, current weight and any change of weight during last 2 weeks, blood pressure and pulse immediately before the interview time, any significant change in the diet, especially salt intake.

Current medicine list, daily vital record and symptoms related information during the last 2 weeks sent over whatsapp was reviewed. Subsequently appropriate changes in medications if needed were made. Weight gain and worsening shortness of air were main indicators to increase diuretic dose. Depending upon clinical status, patients were also recommended to have repeat lab tests of renal profile and serum electrolytes. There were no technical difficulties during the interview for follow-ups and in fact the whole process over the phone went through very smoothly.

STATISTICAL ANALYSIS

Baseline demographics were calculated in numbers and percentages. The differences in breathing symptoms New York Heart Failure (NYHF class) weight and renal functions at baseline and at the 8-week follow-up was calculated using t –test.

RESULTS

A total of 31 patients were enrolled in the study among which 64% were male, the average age was 55 years and average Left Ventricle Ejection Fraction (LVEF) of 26% followed for 8 weeks. A total of 47% were diabetics, 64% were documented to have Coronary Artery Disease (CAD) and 67% had previous history of hypertension (Table-1). More than 64% patients were on two or more doses of Lasix 40 mg per day and 31% were on additional diuretic, Metolazone of varying doses, 2.5 mg twice a week to 2.5 mg once a day. A total of 93% patients reported CHF symptoms of NYHF class II or III, and 3% with NYHF class IV symptoms. Patients were also categorized into four groups depending upon their most recent serum creatinine level (Table-3). Only 19% patients had normal serum creatinine levels, and 12 % patients had severe derangement of creatinine levels, while 46% of patients had creatinine 1.4 – 2 mg/dl and 22% between 2 – 3 mg/dl. Average weight at baseline was 73 kg.

Table-1: Baseline demographics (N = 31).

Males: 64% *Age (years)*	*Number of patients (%age)*
< 40	02 (7)
40 – 50	10 (32)
51 – 60	08 (25)
61 – 70	08 (25)
71 – 80	03 (10)
Average 55 years	
Medical History	
Coronary artery disease	20 (64)
Diabetes Mellitus	15 (48)
Hypertension	21 (67)
Left Ventricle Ejection Fraction (LVEF)	
15 – 20%	06 (19)
21 – 25%	11 (35)
26 – 30%	08 (25)
31-35%	06 (19)
Average LVEF 26%	
Medications:	
Lasix dose 40 mg per day	11 (35)
Lasix dose > 40 mg per day	20 (64)
Additional diuretic (Metolazone)	12 (38)
Beta blockers	25 (80)
ACE/ARBs	27 (87)
Aspirin	23 (74)
Insulin	09 (29)
Oral hypoglycemic	12 (38)

During 8 weeks follow-up period, 14(45%) patients mentioned of mild to moderate worsening of shortness of air and 8 of 14 patients had more than one kg weight gain. All of the 8 patients with weight gain reported new or worsening of ankle edema compared to first telemedicine visit. Overall, 11 (35%) patients required additional diuretics, 40 mg to 80 mg oral Lasix or Metolazone 2.5 mg. Among these, two patients were given additional one-time intravenous Lasix 60 mg. The additional oral diuretics were recommended for 3 days to 2 weeks with successful relief of ankle edema and/or symptoms of shortness of air. Three patients needed adjustment of BP medicines. All patients completed repeat renal function and serum electrolytes tests during the follow-up period. Only 2 patients were admitted to CCU for symptoms of CHF exacerbation and required IV infusion of diuretics. Of the two, one patient didn't call for urgent telemedicine consultation and instead opted to go to hospital directly; the other did receive

Table-2: Functional status at baseline and after 8 weeks follow-up.

At Baseline *NYHF Class*	*Number of Patients (% age)*
I	01 (3)
II	15 (48)
III	14 (45)
IV	01 (3)
After 8 weeks Follow-up	
NYHF CLASS	Number of patients (%age)
I	01 (3)
II	13 (42)
III	14 (45)
IV	03 (9)
No significant difference at baseline and after 8 weeks follow-up. P = 0.45	

Table-3: Serum creatinine levels at baseline and after 8 weeks follow-up.

At baseline Serum Creatinine (mg/dl)	No. of Patients (%age)
Normal	06 (19)
1.4-2	14 (46)
2-3	07 (22)
>3	04 (12)
At 8 weeks follow-up	
Serum Creatinine (mg/dl)	No. of Patients (%age)
Normal	03 (8)
1.4-2	16 (53)
2-3	08 (26)
>3	04 (13)
No significant difference at baseline and after 8 weeks follow-up. *P = 0.51*	

additional oral Lasix 40 mg for 2 days with no relief and subsequently admitted in CCU.

At the end of 8 weeks follow-up period, there was no significant change in NYHF class status *(P = 0.46),* or weight *(P = 0.34)* (Table:2). The intervention with adjustment of diuretic doses and other medication was highly significant for symptomatic relief in majority of the cases. Similarly, there was no significant change *(P = 0.51)*

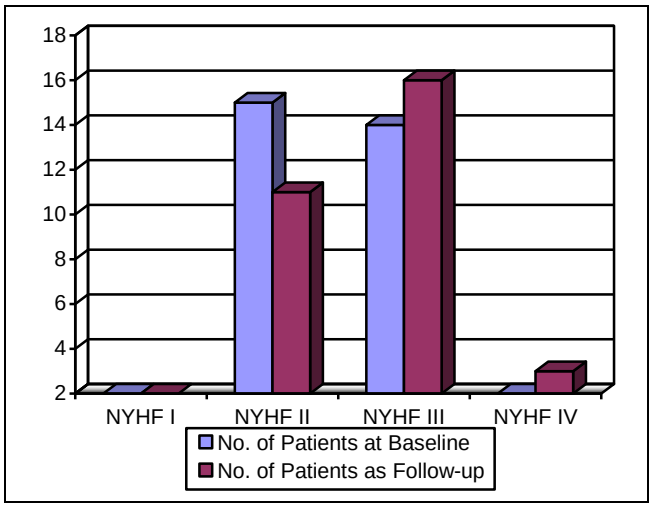

Fig. 1: Graph representing no statistically significant change in NYHF class at baseline and after follow-up (P = 0.46).

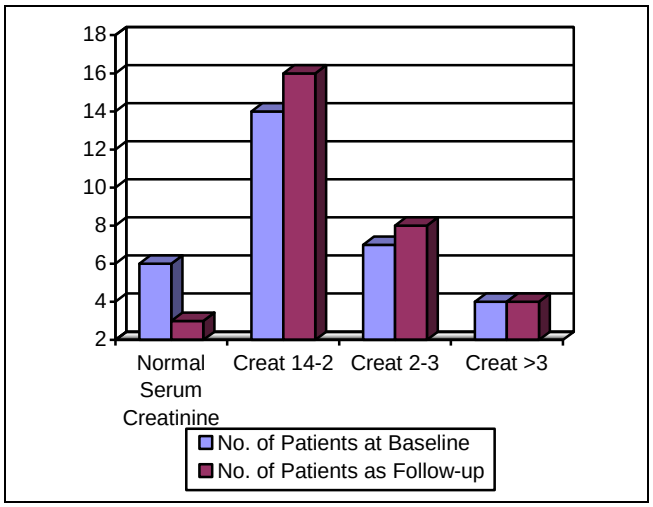

Fig. 2: Graph showing no significant change in Serum Creatinine at baseline and after 8 weeks follow-up. (P = 0.51).

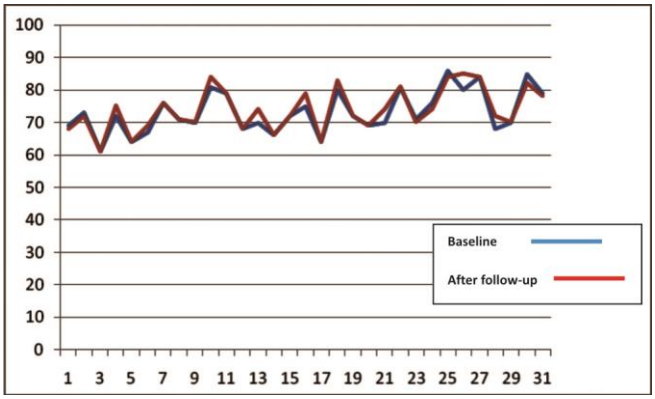

Fig.3: Graph showing no significant change in weight at baseline and after 8 weeks follow-up (P = 0.34).

in the serum creatinine levels (Table-3). With appropriate use of telemedicine driven interventions, hospitalization is successfully avoided in 10 patients out of 31, which is highly significant *(P = 0.001)*.

The COVID-19PCR test on these patients was not done as none of the patients reported any symptoms suggestive of viral illness during the 8 weeks period.

DISCUSSION

CHF is a complex cardiac syndrome with an increasing prevalence across the world[3]. Uncontrolled hypertension, diabetes mellitus, coronary artery disease has resulted in significant rise of CHF syndrome which has very high morbidity and mortality.[9,10] In the absence of a definitive curative therapy, the management is aimed at maintaining a better quality of life by symptomatic relief of heart failure symptoms. This require regular and close follow-up with specialized cardiology team otherwise majority of these patients end up in CCU with exacerbation of CHF symptoms requiring IV medications and other supportive measures.

Telemedicine is an evolving concept and a promising practice for effective remote management of CHF patients on long-term treatment regimen that requires minor adjustments in the medication profile.[7,11] Observance of few basic parameters and respective precautions, most of them can be carried out at

home by the patient himself or the attendants can make a difference to a satisfactory extent.

In current lockdown situation related to COVID-19, the importance of telemedicine increases further to manage CHF patients who require ongoing close follow-ups to keep them symptoms free as well to protect them from virus exposure.[12] In this context, we analyzed a sample of 31 CHF with or without the underlying coronary artery disease in association with other comorbidities notably diabetes mellitus, hypertension and deranged renal-function profile, for the clinical outcome in response to telemedicine-assisted remote monitoring and advice about the management plan. Our strategy effectively identified patients with worsening symptoms and subsequently managed them successfully by adjustment of their medication, especially diuretics. Only two out of 31 patients suffered significant clinical deterioration necessitating hospitalization. Rest of the sample population was managed adequately to a level permitting home-based treatment. Henceforth what was found in these 8 weeks span a clinical outcome, suggested, telemedicine to be quite fruitful in managing the patients with heart failure.

Unfortunately, here in this country such type of data and studies are not available to date, to provide us grounds for adequate comparison regarding the utility of telemedicine in this context. Yet a limited number of relevant studies in other areas of the world have advocated the utility of telemedicine and have recommended it as an efficient tool in the management of heart failure. A meta-analysis about the effectiveness of telemedicine carried out in 2017 concluded encouraging reduction in heart failure associated hospitalization and mortality in population that was subjected to telemedicine assisted management.[13,14] Such types of appraisals are exceedingly important in encouraging telemedicine for remote management of the patients with heart failure in the background of ongoing lockdown situation.

Reasonable deductions from these studies as discussed are consistent with our findings in this study. Yet off course, there are a number of hurdles and demerits when it comes to remote management that is reliant largely on technology, its availability, access, and prevalence of its use in the concerned population and many more, as suggested by various studies including a recent study published in May 2020 that marks several interactional difficulties and most significantly, the inability to perform relevant clinical examinations as the main demerits in the use of telemedicine.[15]

Henceforth, it's quite evident that telemedicine has got its own diversified merits and demerits, but the employment of a specific medium such as telemedicine for the management of disease conditions including heart failure, is a multifactorial consideration that should be reliant on comparative weight age of pros and cons in connection to the current circumstances. Also with the recent era, whereby the inevitable social distancing in order to halt the spread of COVID-19 necessitates the utilization of such a medium to serve the purpose.

CONCLUSION

Telemedicine during current lockdown related to COVID-19 pandemic appears to be very effective to manage successfully CHF patients at home and prevent their hospitalization while keeping them safe from virus exposure.

LIMITATIONS OF STUDY

There were a few limitations in the present study. Sample size was small and study duration was short. Future larger scale studies may help in better description of this mode of health care delivery as a safer and economical option for general public of Pakistan.

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CONFLICT OF INTEREST

None to declare.

FINANCIAL DISCLOSURE

None to disclose.

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Author's Contribution

JA: Conception, design, Acquisition of data and final approval of the published version.

IA: Article drafting and acquisition of data.