ORIGINAL ARTICLE

THE EFFECT OF AN ORGANIZED HEART FAILURE PROGRAM ON THE RATE AND TIME TO FIRST READMISSION IN PATIENTS DISCHARGED WITH A DIAGNOSIS OF ACUTE DECOMPENSATED HEART FAILURE ADMITTED TO CARDIOLOGY DEPARTMENT, AYUB TEACHING HOSPITAL, ABBOTTABAD

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Background: Heart Failure (HF) is globally recognized as one of the major causes of morbidity and mortality as it has severe lasting impacts on quality of life, healthcare finances, and survival. Keeping in view the poor prognosis associated with ADHF admissions, structured heart failure programs can enhance treatment adherence, foster better self-care, and lower the rate of readmissions. This study was carried out to evaluate the impact of a structured heart failure program on the readmission rates and clinical outcomes of patients with acute decompensated heart failure at Ayub Teaching Hospital, Abbottabad. **Methods:** Thirty patients were recruited in this longitudinal study as per the inclusion criteria; aged between 20 to 80 years, within 7 days of their discharge, and followed for 20 weeks in a specialized heart failure clinic, with regular follow-ups, guideline-directed medical therapy (GDMT) optimization and patient education. **Results:** Out of the 30 patients enrolled (mean age 65.26 years; 53% male) with a history of 2 prior admissions for acute decompensated heart failure (ADHF) in the last 6 months, 24 completed the program. GDMT adherence improved significantly, with beta-blocker usage reaching 100%. The unscheduled readmission (defined as unscheduled visit for worsening heart failure resulting in admission) for worsening heart failure or all cause death rate was 13%. There were no deaths recorded due to worsening heart failure. NT-proBNP levels declined notably, and ejection fraction improved or remained stable for most of the patients. Approximately 23% of the patients were classified as NYHA class I at baseline, which improved to 67% at the final visit. **Conclusion:** This pilot study demonstrated that a structured heart failure program improved clinical outcomes in terms of unscheduled admissions or deaths due to worsening heart failure underscoring the need for establishing specialized multidisciplinary heart failure clinics.

Keywords: Heart Failure program; Acute Decompensated Heart failure; GDMT

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INTRODUCTION

Heart Failure (HF) is globally recognized as one of the major causes of morbidity and mortality as it has severe lasting impacts on quality of life, healthcare finances, and survival. According to a study there is a substantial burden of heart failure in Pakistan with the age-adjusted prevalence of 404.12 per 100000 population.[1]

ADHF is defined as either de novo onset of symptoms or worsening signs and symptoms developed in patients with a previous diagnosis of HF. In patients above the age of 65 years, it is one of the most recurrent causes of impromptu hospital admissions.[2–4]

Hospital admissions for ADHF are important events in the natural history of heart failure as they indicate a worse prognosis.[5] According to the data available, the majority of heart failure readmissions happen within 30 days to 3 months,[6] and there are a variety of multifactorial reasons why this happens, including worsening heart failure, suboptimal care,[7] poor compliance, comorbidities, and increased NT-proBNP levels[8]. Keeping in view the poor prognosis associated with ADHF admissions, structured heart failure programs should be designed to monitor patients under the care of multidisciplinary teams keenly. According to several studies, these initiatives prioritizing medication optimization, patient education, and routine follow-up can enhance treatment adherence,

foster better self-care, and lower the rate of readmissions.

This study represents the first attempt at establishing and evaluating the impact of a heart failure program in Ayub Teaching Hospital, a tertiary care hospital without pre-existing multidisciplinary HF management. We aimed to assess its impact on ADHF readmission rate and patient outcomes in our hospital. The results of our study shall have essential implications for healthcare providers, policymakers, and patients, providing insights into the potential benefits of structured interventions in reducing readmissions and improving outcomes in this high-risk population.

The objective of this study was to evaluate the impact of a structured heart failure program on the readmission rates and clinical outcomes of patients with acute decompensated heart failure at Ayub Teaching Hospital, Abbottabad.

MATERIAL AND METHODS

In this longitudinal study, patients were recruited in the study as per the inclusion criteria; age between 20–80 years, both genders, diagnosed with acute heart failure as per operational definition, two heart failure admissions in the past 6 months, and ambulatory patients, with intact higher mental status on discharge. Patients were excluded based on being very frail or bedridden, unable to consent, or with impaired higher mental status, and those who refused to be a part of this study. Patients with heart failure with preserved ejection fraction were also excluded.

Thirty patients who fit the inclusion criteria were recruited into our first-ever disease management program, which ran from November 2023 to March 2024. All patients were recruited into the program within 7 days of discharge and were labelled high-risk for readmission with high NT-ProBNP levels at the baseline. Demographic information, including age, gender, weight, blood pressure, pulse rate, jugular venous pressure, and the presence of oedema, was documented. A thorough medical history was obtained, followed by a comprehensive physical examination, with comorbidities duly noted. The NYHA classification was assigned based on clinical history, and ejection fraction was estimated via echocardiography. NT pro-BNP levels were assessed at baseline and at the final visit. All data were meticulously recorded using specially designed forms.

Patients underwent counselling and education about their illness, compliance reinforcement, dietary advice, and medication titration during each visit. Nonsteroidal anti-inflammatory drugs and similar medications were strictly prohibited due to their potential to worsen heart failure. Primary caregivers were involved in all sessions.

Patients were provided with weighing scales, instructed to record their dry weight, and monitor it daily. To improve drug compliance, we attempted to address the major barrier of financial constraint by providing free medications by post through special arrangements to many of the patients. A direct contact number for the principal investigator was provided for urgent concerns, and follow-up occurred every two weeks to optimize heart failure management.

Weekly phone calls were made to inquire about the current health status, dry weight, and compliance, and any concerns were addressed as necessary. Emergency IV diuretic administration and unplanned hospitalizations were recorded. All of the data gathered was sequentially documented for the study duration of 20 weeks. Data was analyzed using appropriate tools.

RESULTS

A total of 30 patients were enrolled in the program; who had a history of two prior admissions for acute decompensated heart failure (ADHF) in the last 6 months. The mean age of the cohort was 65.26 years; with 53% being male with an average weight at recruitment around 60 kg. Approximately 73% of the patients were classified as NYHA class II or III. The mean NT-ProBNP level at baseline was 11,463.24pg/ml. At enrolment, only 23% of patients were optimally beta-blocked, achieving a resting heart rate of less than 70 beats per minute. Beta-blocker and/or Ivabradine use was 83%, while the use of Angiotensin receptor/Neprilysin inhibitors (ARNI), ACE inhibitors (ACE I), or angiotensin receptor blockers (ARB) was 67%. Mineralocorticoid Receptor Antagonists (MRA) and Sodium Glucose co-transporter 2 (SGLT2) inhibitors each were being prescribed at the rate of 37%. (see Table-1 below)

Out of 30, a total of 24 patients completed the 20 weeks of follow-up. The 6 missing patients constitute of 2 deaths, 1 patient lost to follow-up, and 3 who were only contacted telephonically and found to not have suffered any readmissions for the duration of the study (Figure-1). The two deaths that happened at home were sudden deaths presumed to be due to arrhythmia. There were 6 elective admissions; 4 were for supplementary intravenous loop diuretics, 1 was admitted from the follow-up visit for intravenous volume replacement, and another was for investigations of chest pain. There were only 2 emergency/unscheduled admissions for ADHF during the study period. Therefore, the total death and/or unscheduled readmission rate during the study period was 13%, with no deaths being reported during the 20 weeks due to acute decompensated heart failure. NT-proBNP levels were increased in all patients at baseline, and most exhibited a slight drop at the end,

with only 1 patient showing a marked reduction, below 100pg/ml. Heart failure-related hospitalizations were primarily observed in patients with persistently elevated NT-proBNP levels. Among the 15 patients who showed a reduction in NT-proBNP, only one was hospitalized despite a decrease from 7445.4 to 2969pg/ml. (Figure-2).

'A' indicates patients who were admitted either electively or through emergency. 'D' signifies deaths in patients 29-30. Patient 25 was lost to follow-up. Patients 26 through 28 did not complete the 20-week follow-up but were alive and free from admission. At baseline the NYHA classification assigned to patients based on clinical history was as follows; I=23%, II=43%, III=30% and IV=4%. After 20 weeks, among the 24 patients who completed the final visit, the classification assigned exhibited marked improvement; I=67%, II=25%, III=4%, and IV=4%. (Fig-3 and 4).

All patients' weight in kg either remained constant or showed minor changes. The average weight of 19 patients who had their weights checked on arrival and on the 5-month mark showed a decline from an average of 67.5 kg to 61.2 kg. The weight data in 5 patients was missing or incomplete. (Figure-5).

The following results were achieved after GDMT optimization in specialized care from usual care: 100% patients.

were on either a beta blocker or Ivabradine or both. 96% patients were on ACE-I, ARB, ARNI or Hydralazine. Mineralocorticoid Receptor Antagonist and SGLT2 usage increased from 37% to 60%, and from 37% to 72%, respectively. (Figure-6)

Ejection Fraction of the participants over the study period was recorded via 2D echocardiography, with significant decline noted in only 2 of them (from 40 to 30%, and from 40 to 35%, respectively) while the rest of the patients demonstrated either improved or stable values.

Table-1: Summary of baseline characteristics recorded at recruitment visit.

Parameter	Value
Mean Age	65.26
Males (%)	53
Females (%)	47
Average weight at recruitment (Kg)	60.03
Patients on Loop Diuretics at Baseline	87
Ace I, Arb or ARNI At Baseline (%)	67
MRA At Baseline (%)	37
Sglt2 At Baseline (%)	37
Bb &/or Ivabradine at Baseline (%)	83
Average NT Pro BNP at Baseline	11463.24

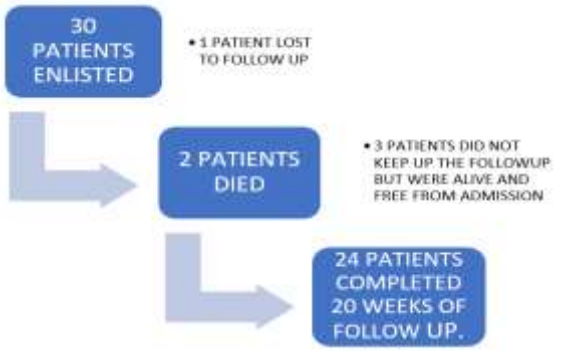

Figure-1: Summary of the cohort for the duration of study with outcomes

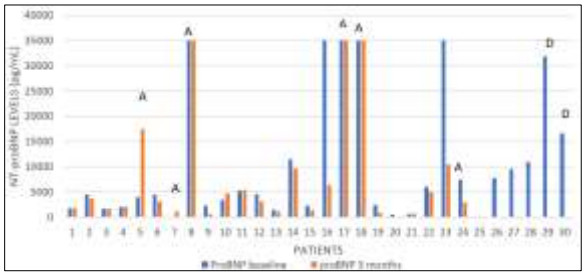

Figure-2: NT-proBNP levels at baseline and at 20 weeks

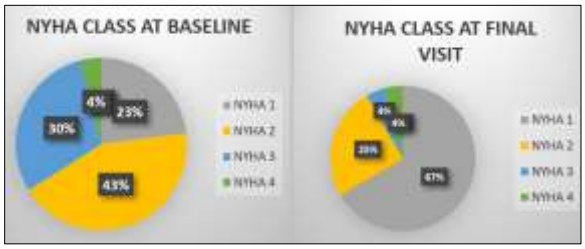

Figure-3: NYHA class at baseline. (*n*=30) Fig-4. NYHA class at final visit. (*n*=24)

Figure-5: Weight changes of the cohort during the study period

Figure-6: Summary of GDMT optimization from first to final visit

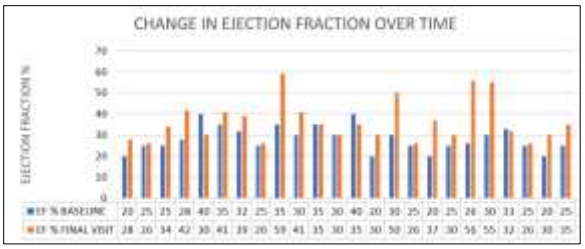

Figure-7: Summary of the Ejection fraction trends over the 20-week period

DISCUSSION

The current guidelines of the European Society of Cardiology state that all heart failure (HF) patients be included in a disease management program (DMP), giving it a class 1 indication. Evidence from well-organized studies, including findings by Inglis *et al.* (2015) and Koshimizu *et al.* (2018), highlights the ability of structured HF programs to reduce hospital readmissions and mortality, validating the trends observed in our study. These studies found that a comprehensive HF program, including education, exercise, and telemonitoring, lowered hospitalizations and improved quality of life.[10,11] In a study of 257 HF patients, those in specialized clinics had lower hospitalization or mortality rates compared to usual care (38% vs. 58%).[12] Another study showed a 50% reduction in mortality with HF clinic follow-up.[13] In our study, only 2 patients died at home, and 2 had unscheduled emergency admissions for acute decompensated heart failure (ADHF). This totals to a 13.7% incidence of death or unscheduled admissions. In a preceding study done by the authors, the rate and time to readmission of ADHF patients under usual care at Ayub Teaching Hospital, Abbottabad were determined, which showed a death/readmission rate of 34% in a cohort of 222 patients, within 6 months. Compared with the findings of this study the improvement in patient outcomes was 61.8% compared to the historical controls.

Another study showed that patients who were optimized with GDMT as inpatients when not followed up in specialized care clinics suffered more hospitalizations or deaths compared to those who were followed up in specialized heart failure clinics.[14] Early follow-up after discharge is crucial. Studies show that timely HF clinic visits, within 7 days, significantly reduce 30-day rehospitalization (13.3% vs. 22%) and mortality (1.2% vs. 11.6%) compared to national averages.[15] In the present study, patients were followed with weekly telemonitoring to enquire about their health status, or history of unscheduled hospitalizations and to ensure compliance. In addition, fortnightly visits to the clinic for proper evaluation and medication titration led to improved adherence to guideline-directed medical therapy (GDMT). Upon concluding appointment, the use of Renin-Angiotensin system inhibitors or ARNI reached 96%, and beta-blocker use reached 100%.

These findings are consistent with the CHAMP HF registry; which highlights gaps in GDMT use in usual care.[16,17] Furthermore, they were provided with a contact number for a registrar-level medical officer for their queries.

In a prospective study of patients with heart failure and reduced ejection fraction, it was established that follow-up in a specialized heart failure clinic led to significant symptomatic improvement, higher rates of optimal guideline-directed medical therapy, and improved ejection fractions compared to usual care.[18] Following similar trends, optimization of the GDMT led to improved or stable ejection fractions in 22 out of 24 of our patients, along with notable symptomatic improvement in NYHA Class-I (67% at the last follow-up, compared to 23% at the initial visit). As seen in previous studies, patients with reduced NT-proBNP levels (an important marker of cardiovascular risk) had better outcomes.[18,19] In a similar manner, NT-proBNP levels decreased in our cohort, from an average of 10,064 pg/mL to 7,847 pg/mL at the concluding visit.

We did 4 elective admissions from the follow-up visit to optimize the patients' congestive state. These patients were stable and could have been managed with outpatient intravenous diuretics or day-case intravenous diuretic therapy. All these patients were noncompliant with their GDMT. It is likely that some admissions in heart failure may not lead to high event rates.[20] They may even provide opportunities to initiate or up-titrate GDMT, address compliance and socioeconomic factors affecting adherence to GDMT. A study by Gupta *et al.* revealed that heart failure mortality increases in hospitals penalized for high 30-day readmission rates, suggesting that efforts to reduce readmissions may compromise survival in some patients.[21]

Additionally, another study found that combined follow-up by a cardiologist and general practitioner reduced mortality or rehospitalization but was associated with increased heart failure readmissions.[22] HF admissions, while burdensome, also offer opportunities to optimize care.

Our analysis demonstrated that elective admissions can be used to optimize patients' GDMT and manage congestion, highlighting the potential benefits of elective readmissions in improving long-term outcomes.

CONCLUSION

This pilot study emphasizes the effectiveness of close follow-up in a structured heart failure (HF) management program reducing the burden of hospital admissions and inpatient mortality rate (13%) in a resource-limited setting.

Additionally, improved adherence to GDMT (100% use of beta-blockers at final visit), reduced NT-proBNP levels, and improved or stabilized ejection fraction in the majority of patients underscore the importance of dedicated multidisciplinary HF clinics in optimizing patient outcomes.

While the results are promising, further large-scale, randomized studies are necessary to validate these findings and assess the sustainability of such programs in similar settings.

LIMITATIONS

- The study included only 30 participants, limiting the statistical power and generalizability of the findings. It was however a pilot study done with limited resources. A large-scale study shall be needed to validate the results of this small study.
- While this study lacks a direct control group, a prior study done by the authors on readmission rates for heart failure patients under usual care at Ayub Teaching Hospital Abbottabad, provides some context for comparison.
- The study relied on pharmaceutical assistance for GDMT provision and donations for weighing scales, which may not be sustainable or replicable in larger settings.

AUTHORS' CONTRIBUTION

SS: Data collection, data interpretation. MIK: Study design, data analysis, write-up. RA: Data collection. FJ: Data collection, data interpretation. ZUK: Data collection. AA: Data collection. MK: Proof reading.

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