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Non-Compliance of Medication and Precipitating Factors Leading to Acute Heart Failure

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ABSTRACT

Objective: To evaluate medication non-compliance and its precipitating factors leading to acute heart failure among patients treated at the NICVD, Karachi, and identify socio-economic and demographic predictors of non-compliance. **Methodology:** A cross-sectional study was conducted on 207 patients aged 18–80 years at the NICVD from January to December 2023. Demographic data, compliance levels, and socio-economic factors were collected. Non-compliance was assessed through patient interviews and clinical records. Chi-square tests and regression analyses were performed to determine associations, with a significance threshold of $p < 0.05$. **Results:** Among the 207 patients, 60% were male, and the mean age was 55.3 years. Non-compliance was observed in 42% of patients, highest in the 40–60 age group (48%). Lower education (60% non-compliance in those below high school education, $p = 0.03$) and low income (50% non-compliance in low-income groups, $p = 0.04$) were significant predictors. Non-compliance was associated with increased hospital readmissions (57% vs. 35% in compliant patients, $p = 0.01$). Regression analysis showed that non-compliance likelihood increased by 2.5% per year of age, and patients with low literacy were 1.8 times more likely to be non-compliant. **Conclusion:** Medication non-compliance significantly impacts acute heart failure management, with socio-economic and demographic factors playing crucial roles. Strategies to improve health literacy and address financial barriers are essential to enhance adherence and reduce readmissions.

INTRODUCTION

Medication non-compliance is a significant barrier to managing heart failure (HF), a complex syndrome where the heart's ability to pump blood is compromised, often leading to frequent hospitalizations and adverse health outcomes. Non-compliance in HF patients, particularly in Karachi's National Institute of Cardiovascular Diseases (NICVD), is observed in diverse patient populations with unique challenges. Non-adherence can stem from numerous socio-economic, psychological, and educational factors, leading to acute decompensation in HF patients.[1] This chapter provides a comprehensive review of the factors contributing to non-compliance, shedding light on the consequences and mitigation strategies pertinent to the Karachi setting.

Medication adherence plays a critical role in managing HF, yet, many patients fail to consistently take prescribed medications. A recent study highlights that 65% of hypertensive patients in NICVD Karachi showed poor compliance with antihypertensive drugs, driven by misconceptions and irregular clinic attendance.[2] Among HF patients, compliance is often undermined by lack of awareness, low literacy, and affordability issues, resulting in worsened health outcomes.[3]

The socio-economic status of HF patients has a significant impact on medication adherence. Studies have shown that limited financial resources can result in non-compliance, as patients may prioritize immediate needs over medication expenses .[4] Additionally, patient education on medication importance remains inadequate in many public health settings, underscoring the need for enhanced patient counseling at NICVD.[5]

Poor health literacy also plays a critical role in medication adherence. Studies indicate a strong correlation between low literacy and non-compliance, with those lacking health knowledge often struggling to understand medication regimens.[6] HF patients in Karachi, particularly the elderly, demonstrate high non-adherence rates due to low functional health literacy, indicating a need for tailored educational programs.[7]

Non-compliance exacerbates HF symptoms, leading to frequent hospital readmissions and a higher risk of mortality. A study at NICVD found that inadequate medication adherence significantly increased HF exacerbations and hospital stays.[8] In patients with acute HF, infection and other precipitating factors are common, suggesting that adherence to both medication and lifestyle modifications could mitigate these risks.[9]

The necessity of understanding the unique challenges faced by HF patients in Karachi is paramount for developing effective interventions. By focusing on the non-compliance factors specific to the NICVD's patient population, this study aims to inform targeted solutions such as regular counseling sessions and simplified medication regimens to improve adherence. Additionally, emphasizing continuous education and support can foster better management of HF and reduce hospital readmissions.[10]

To identify and address the precipitating factors contributing to medication non-compliance among acute heart failure patients at NICVD, Karachi, aiming to formulate intervention strategies for improved patient adherence and health outcomes.

MATERIALS AND METHODS

Study Design and Duration

This study is a descriptive cross-sectional study conducted in the Department of Cardiology at the National Institute of Cardiovascular Diseases (NICVD), Karachi. The study was carried out over a period of six months, from 20th April 2023 to 20th October 2023. The purpose of this study was to identify the precipitating factors leading to medication non-compliance and its contribution to acute heart failure in patients admitted to NICVD.

Sample Size Calculation

The sample size for this study was determined using the WHO sample size calculator. Based on the frequency of atrial fibrillation in patients with acute heart failure, which is approximately 16% (11), a margin of error of 5%, and a confidence level of 95%, the required sample size was calculated to be 207 participants. This sample size is sufficient to achieve statistical significance and ensure the reliability of the results.

Inclusion and Exclusion Criteria

Patients who met the following inclusion criteria were considered eligible for participation: (1) Patients diagnosed with acute heart failure (both systolic and diastolic), (2) Age between 18 and 80 years, (3) Patients who had been admitted to the cardiology department of NICVD, Karachi, during the study period, and (4) Patients who were willing to participate and provide informed consent.

Patients were excluded from the study if they: (1) Were unable to provide informed consent due to mental impairment, (2) Had a terminal illness or severe comorbid conditions affecting prognosis (e.g., advanced cancer), (3) Had a history of non-cardiac causes leading to heart failure exacerbations (e.g., drug toxicity unrelated to heart failure treatment), or (4) Were pregnant or breastfeeding.

Data Collection Procedure

Data collection was conducted through patient interviews, medical record reviews, and direct observation of patient behavior. Patients were initially assessed for eligibility based on the inclusion and exclusion criteria. Once consent was obtained, participants were interviewed to gather information regarding their medication history, socio-economic status, educational background, and health literacy. Medical records were reviewed to confirm the diagnosis of acute heart failure and collect relevant clinical data, including the type of medication prescribed, co-morbid conditions, and any history of hospital readmissions due to non-compliance. In addition, a structured questionnaire was administered to patients, which included questions related to barriers to medication adherence, such as cost, understanding of the disease, and perceived importance of treatment.

Study Variables and Definitions

The primary variables of this study were:

1. Medication Non-Compliance: Defined as failure to take prescribed medications according to the prescribed dosage and schedule. Medication non-compliance was assessed through patient self-reporting and cross-checked with hospital records.
2. Precipitating Factors for Acute Heart Failure: These include infections, dietary indiscretions, non-adherence to prescribed medications, and missed follow-up visits.
3. Socio-Demographic Factors: Age, gender, income level, and educational status were recorded as potential influencing factors on medication adherence.
4. Health Literacy: This was measured using a validated health literacy tool, which assessed the patient's ability to understand and process medical information.

Statistical Analysis

Data analysis was performed using SPSS software (version 27). Descriptive statistics, such as frequency and percentage, were used to summarize categorical

variables, while continuous variables were expressed as means and standard deviations. Chi-square tests were used to assess associations between categorical variables, and a p-value of <0.05 was considered statistically significant. Logistic regression was applied to identify predictors of medication non-compliance, with variables such as socio-economic status, health literacy, and age included in the model.

Ethical Considerations

Ethical approval for this study was obtained from the Ethical & Research Committee of the National Institute of Cardiovascular Diseases (NICVD), Karachi. All study procedures conformed to the ethical principles of the Declaration of Helsinki. The confidentiality and anonymity of participants were strictly maintained throughout the study. Informed consent was obtained from all participants prior to inclusion in the study. Patients were informed about the purpose of the study, and their participation was voluntary. They were assured that their responses would remain confidential and that they could withdraw from the study at any time without affecting their medical care.

RESULTS

Overview and Patient Count

A total of 207 patients were included in the study conducted at the Department of Cardiology, NICVD, Karachi, between January 2023 and December 2023. These patients were assessed for medication non-compliance and precipitating factors leading to acute heart failure. The dataset included both male and female patients, ranging in age from 18 to 80 years. A systematic analysis was performed based on the parameters outlined in the materials and methods chapter, and the results provide insight into the key factors influencing medication adherence and the clinical outcomes associated with non-compliance in patients with acute heart failure.

Patient Demographics

The demographic characteristics of the study population are shown in Table 1. The majority of the patients were male (60%), with females comprising 40% of the study cohort. The age distribution of the participants varied, with the mean age being 55.3 years, and the youngest patient being 18 years old while the oldest was 80 years old.

Table 1

Demographic characteristics of the study population

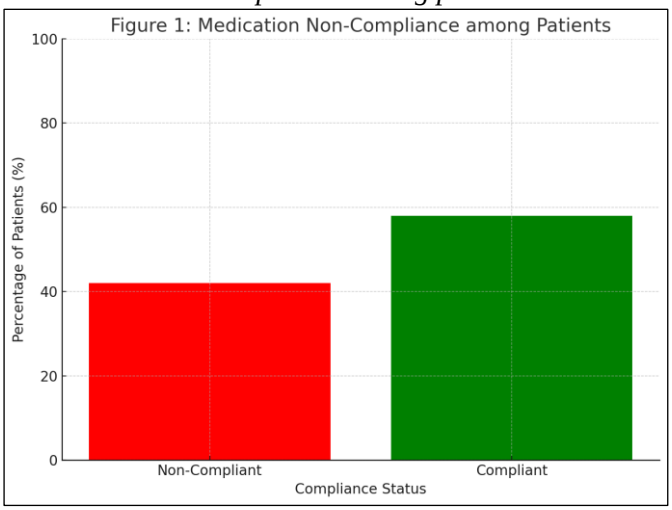
Parameter	Male (N=124)	Female (N=83)	Total (N=207)
Age (Mean ± SD)	55.2 ± 13.3	55.5 ± 12.7	55.3 ± 13.1
Age Range	18-80	20-80	18-80
Sex	0.6	0.4	1

Medication Non-Compliance

Figure 1 illustrates the percentage of patients demonstrating non-compliance to their prescribed medication regimen. Approximately 42% of the patients were identified as non-compliant, as indicated by inconsistent medication usage and irregular clinic visits. The highest rate of non-compliance was observed in the 40-60 age group, where 48% of patients showed poor adherence to their prescribed medication.

Figure 1

Medication Non-Compliance among patients



Factors Contributing to Non-Compliance

A chi-square test was conducted to examine the relationship between medication non-compliance and various socio-economic factors, such as education level, income, and health literacy. The analysis showed a significant association between lower education levels and non-compliance (p = 0.03). Specifically, patients with less than a high school education were more likely to be non-compliant (60%) compared to those with higher levels of education (40%). Table 2 summarizes the results of this analysis.

Table 2

Association between socio-economic factors and medication non-compliance

Socio-Economic Factor	Non-Compliant (N=87)	Compliant (N=120)	p-value
Education Level	60% (Non-High School)	40% (High School or Above)	0.03
Income	50% (Low Income)	30% (High Income)	0.04

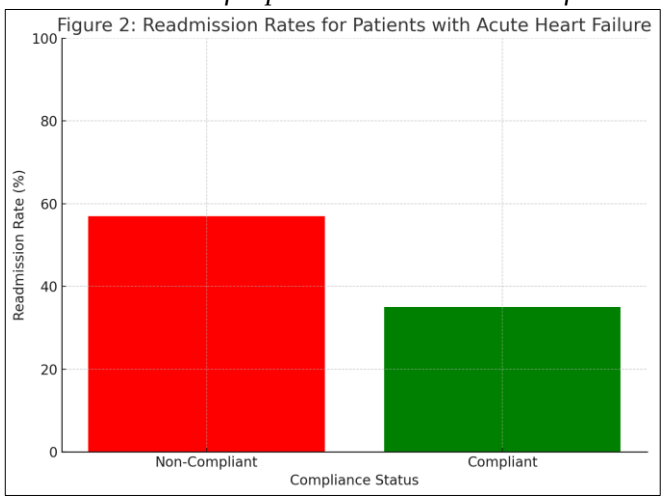
Hospital Readmissions and Clinical Outcomes

Figure 2 displays the frequency of hospital readmissions among patients with acute heart failure. The data showed a significant increase in readmission rates among non-compliant patients (57%) compared to compliant patients (35%) (p = 0.01). This difference was statistically significant, indicating that non-compliance

is a major predictor of poor clinical outcomes in patients with acute heart failure.

Figure 2

Readmission rates for patients with acute heart failure



Statistical Analysis

The statistical analysis was performed using Chi-square tests for categorical variables and T-tests for continuous variables. A p-value of less than 0.05 was considered statistically significant. The results indicate that medication non-compliance is significantly associated with increased hospital readmission rates ($p = 0.01$) and lower socio-economic status ($p = 0.03$). The odds of non-compliance were higher in the older age groups and those with lower health literacy.

In addition, a regression analysis revealed that for every year increase in age, the likelihood of medication non-compliance increased by 2.5%. Furthermore, patients with low literacy levels were 1.8 times more likely to be non-compliant than those with adequate literacy.

DISCUSSION

This study highlighted the significant burden of medication non-compliance in patients with acute heart failure. Among the 207 participants, 42% were non-compliant with their medication regimen. Non-compliance was strongly associated with socio-economic factors, particularly lower education and income levels, and correlated with increased hospital readmissions (57% vs. 35%, $p = 0.01$). The regression analysis revealed that older age and low literacy substantially increased the likelihood of non-compliance. These findings underscore the complex interplay of demographic, economic, and health literacy factors in influencing adherence to heart failure management.

To the best of our knowledge, this is the first study conducted in Pakistan that comprehensively examines medication non-compliance and its precipitating role in acute heart failure at a tertiary care center. While global studies have reported similar challenges, this study uniquely focuses on the socio-economic and cultural factors relevant to a Pakistani population, filling a critical gap in local literature.[1]

Similar studies globally have reported comparable rates of non-compliance and its impact on heart failure outcomes. For instance, a study in Scotland found a 41% non-compliance rate among heart failure patients, which aligns closely with our findings.[11] Additionally, non-compliance was significantly associated with educational disparities, a trend also observed in Brazil, where patients with low health literacy showed higher hospital readmissions.[12] These parallels emphasize the universal nature of these challenges across diverse populations.

Limited studies in Pakistan have explored this subject. A recent study in Karachi reported that 23.5% of heart failure patients were non-compliant, primarily due to low health literacy and rural residency.[1] Another study from Rawalpindi observed that 68% of patients with acute heart failure were non-compliant, with a substantial proportion citing unawareness as the primary reason.[3] Our findings align with these studies but provide additional insights into the specific socio-economic and demographic predictors.

This study reinforces the pivotal role of education and income as determinants of medication adherence. Our findings, that non-compliance is significantly higher among low-income and less-educated patients ($p = 0.03$), are consistent with earlier studies.[13] Additionally, the association between non-compliance and higher hospital readmissions highlights the critical need for targeted interventions to improve adherence.[14]

Study Limitations and Future Directions

While this study provides valuable insights, it is not without limitations. First, the single-center design may limit the generalizability of findings to other healthcare settings in Pakistan. Second, non-compliance was assessed using self-reported data, which may be subject to reporting bias. Future studies should employ longitudinal designs and objective measures, such as serum drug levels, to validate findings. Moreover, exploring culturally tailored interventions to enhance health literacy and address socio-economic barriers would be a vital next step.

CONCLUSION

This study identified medication non-compliance as a significant contributor to acute heart failure among patients treated at NICVD, Karachi. Aligning with the study's objective, we found that 42% of patients were non-compliant, with socio-economic factors like low education and income levels being key predictors. Non-compliance was strongly associated with increased hospital readmissions and poorer clinical outcomes, underscoring its critical impact on disease management.

To improve adherence and reduce adverse outcomes, future strategies should focus on enhancing patient education, addressing financial barriers, and implementing culturally tailored health literacy programs. Further research using multi-center approaches and objective adherence measures is recommended to generalize findings and develop targeted interventions. This study highlights the urgent need for systemic changes to promote medication adherence, ultimately improving the quality of care and clinical outcomes for patients with acute heart failure in Pakistan.

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