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Rational Therapeutic Approaches for the Management of Congestive Cardiac Failure

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ABSTRACT

Background: Heart failure is a serious and progressive condition where the heart's ventricle fails to pump sufficient blood to the body's tissues. Flaws in the rationality of medication use, particularly with narrow therapeutic index drugs like digoxin, have been observed. These include multiple drug-drug interactions, polypharmacy, and therapeutic duplication. Pharmacists play a crucial role in minimizing medication errors through dose adjustments, patient counseling, and ensuring proper administration.

Aims and Objectives: The objective of this project was to assess the appropriateness of recommended pharmacotherapies and their implementation in a clinical setting, focusing on drug-drug interactions, polypharmacy, contraindications, and untreated conditions. **Study Design:** For this study, a specialized questionnaire-based approach was used to gather data on congestive heart failure (CHF) patients. The collected information included patient demographics (name, gender, and age), chief complaints, co-morbidities, past medical and medication history, biochemical tests, diagnosis, social history, allergies, family history, and past surgeries. **Materials and Methods:** From a collection of 20 patient histories, it was observed that the majority of cases involved congestive heart failure (43.57%), followed by left ventricular dysfunction (30.35%), myocardial infarction (17.23%), and atrial fibrillation (8.71%) as the primary causes of hospitalization. Among the patients, co-morbidities such as diabetes mellitus (31.71%) and hypertension (25.23%) were prevalent. The collected data was regularly examined and analyzed. Results were evaluated based on \pm SD (Standard). **Results and Conclusion:** In this study, 60 drugs were identified as contraindicated for patients, and some drugs required monitoring due to their profiles. Among the identified drug-related errors, 56.66% were attributed to drug interactions, often resulting from the simultaneous prescription of two interacting drugs. The incidence of polypharmacy was found to be 8.88%. Narrow therapeutic index drugs accounted for 5.55% of the medications, which were not adequately monitored. The analysis revealed that 33.35% and 25.80% of patients had diabetes and hypertension, respectively, in addition to heart failure. Heart failure was most commonly observed in individuals aged 51-60 years. The study highlighted several irrationalities in prescription practices, including inadequate dose adjustment for patients with chronic renal failure, polypharmacy, drug duplication, adverse drug reactions, cost-related issues, unavailability of therapeutic alternatives, and lack of monitoring for narrow therapeutic index medications.

Keywords: Heart diseases, Cardiac failure, Congestive heart diseases

Introduction

Heart failure is a clinical pathological syndrome in which the ventricle of the heart is unable to pump adequate quantities of blood to the metabolizing tissues during normal activity or at rest [1, 2]. Heart failure may occur from the left side ventricle or right-side ventricle of the heart. It depends upon the pathology of the heart. HF is a serious, progressive condition that is usually chronic and can be life threatening. In the past the condition has been referred as “congestive heart Failure “due to the edematous state commonly shortness of breath, fatigue, limitation of exercise tolerance and fluid retention occur due to fluid backup [3]. Pulmonary and peripheral edema may occur because of fluid retention [4]. The left side heart pump oxygenated blood to all parts of the body. Left side heart failure is unable to pump adequate blood to peripheral circulation and remain in left ventricle; the patient appears left side heart failure sign and symptoms [5, 6]. Pulmonary edema occur as a result of back up the blood into the alveoli and present shortness of breath, difficulty in breathing, and third heart sound [3]. Deoxygenated blood pump by right ventricle into the lungs. It is the inability of the right ventricle to pump blood that’s why it is called right side heart failure [6, 7]. When both left and right ventricles of the heart are affected systolic dysfunction versus diastolic dysfunction [8]. In systolic dysfunction ejection fraction is reduce Heart muscles are too weak the ventricle are stretch out (enlarge, floppy, dilated) ad fail to contract properly [9]. As a result, a small volume of blood is pumped. Ejection fraction Amount of blood being pumped out of the left ventricle each time it contracts. Normal ejection fraction 50-70% [9, 10]. Heart muscles become stiff, thick, rigid, and inelastic so that they no longer fill properly during diastole. So, less blood will be present, and less blood will be contracted [11, 12].

According to epidemiological studies about 2 % of the young population are affected by chronic HF. The dispersion of the HF increases with ages, younger have fewer ratio of about 2 % which their ageless than 60 years as associated to age of 75 years or old which their occurrence ration is more than 10 % [13, 14]. HF takes for 5 % of mature emergency medical admission to hospital (National Institute for Health and Care Excellence) [15]. According to advanced countries report show that about 1-29 % peoples having HF and is more common in aged patient because their activity vanished by ventricular diastolic dysfunction, hypertension and other such factors [16-18]. There is 1/3rd decrease in frequency of HF in women past 40 year and this is attributed to sex as hypertension (HTN) in women while in myocardial infarction (MI) is leading cause. From past 20 year the yearly discharge of HF is increased about 174 % and as age increasing the rate further increased [18]. Annual incidence of HF (per 1000 population) [14].

HF is a syndrome not a disease therefore it is difficult to investigate the main cause of HF. MI may cause HF, but their symptom gradually appears with time without any specific reason of over several ages [19]. Coronary artery disease and hypertension are common cause of HF in patients [20]. Distinguishable etiology of HF includes Valvular heart Diseases, Cardiomyopathies and Mechanical defects such as cardiac valvular dysfunction, hyperthyroidism, and severe anemia [21]. Hyperthyroidism and mitral valve disease are common causes of atrial fibrillation, and a quick and irregular ventricular response might affect cardiac efficiency. Where applicable, better care of the underlying problems could help. Reduce HF symptoms, but the presence of surgical repair of mechanical faults may necessitate the implantation of prosthetic valve [22]. Despite the fact that around 50 % of people with the other half of patient with HF have significant LV systolic dysfunction, while the other half have either a typical or little reduction in LV ejection, a portion however there is no consensus on the threshold for compromised EF, and assessment of each patient relies mainly on clinical symptoms [22, 23]. Chronic HF is classified as mild, moderate, or severed base on clinical symptoms [24]. In this study we focused on the rational therapeutic approaches for the management of congestive heart failure. By exploring pharmacological interventions, non-pharmacological strategies, complementary approaches, patient stratification, and economic considerations, the study seeks to enhance our understanding of effective treatments for CHF. Through rigorous analysis of existing literature, patient data, and potentially conducting clinical trials, this research intends to contribute to the development of evidence-based guidelines and personalized approaches to optimize CHF management and improve patient outcomes.

METHODOLOGY

The study took place at the Cardiology Department of Pakistan Institute of Medical Sciences (PIMS) in Islamabad, Pakistan. It followed a questionnaire-based approach and was conducted over a period of 6 months, starting from July 19th, 2022, and ending on January 19th, 2023. The sample consisted of 20 male and female patients aged between 40 and 70+ years. The sampling technique employed was non-probability consecutive sampling. It is important to acknowledge that the inclusion of these conditions could potentially introduce bias into the study's results.

RESULTS

This study was conducted within the Cardiology department of PIMS, Islamabad. This study involved meticulous data collection and analysis, revealing diverse drug-related problems. The demographic data of the patients is shown in table 1 and figure 1.

Table 1. Patients' demographic data.

Gender	Number of Patients	Percentage
Male	11	56%
Female	9	44%
Total	20	100%

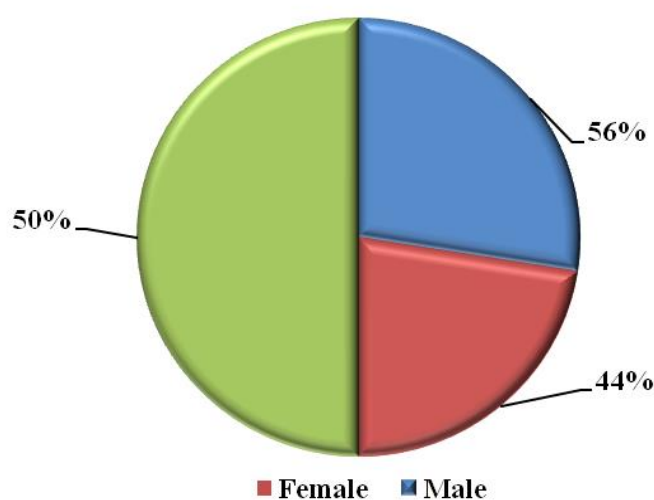


Figure 1. Demographic data on age base.

Age in Years of Patient

The distribution of patient age is presented in both table 2, with the following percentages for different age ranges: 10% for 40 years, 5% for 41-50 years, 50% for 51-60 years, 20% for 61-70 years, and 15% for 71 years onwards. The highest proportion of patients falls within the age range of 51 to 60 years.

Table 2. Age wise patients' percentage.

Age of Patients (Years)	Number of Patients	Percentage
Up to 40	2	10%
41-50	1	5%
51-60	10	50%
61-70	4	20%
71 onward	3	15%
Total	20	100%

Causes of Hospitalization

Patients admitted in hospital were due to CHF, LHF, Atrial fibrillation, and MI and the percent calculated was 42.47%, 31.43%, 8.59%, and 17.40% respectively. While the total numbers of causes of hospitalization in these 20 patients were 21 (100 %) as shown in table 3 and figure 2.

Table 3. Cause of Hospitalization.

Main Cause of Hospitalization	Number of Patients	Percentage
CHF	10	42.47%
Left Heart failure	7	31.43%
Atrial Fibrillation	2	8.59%
MI	4	17.40%
Total	23	100%

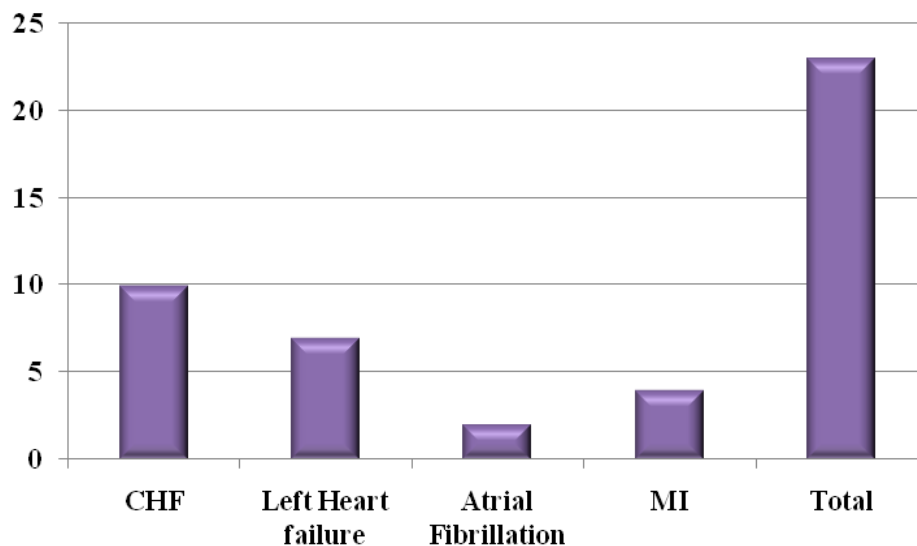


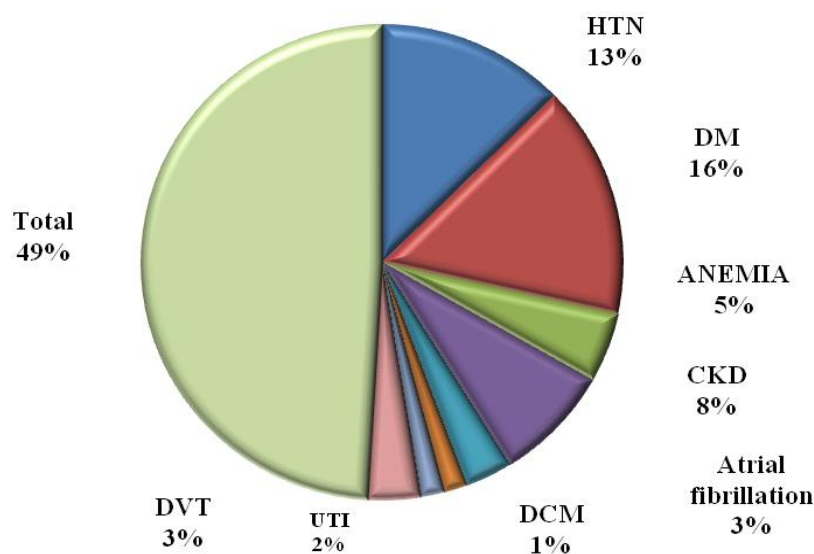
Figure 2. Cause of hospitalization.

Co-existing Diseases

Among patients with heart failure (HF), a total of 31 different diseases were observed. The prevalent diseases among these patients were hypertension (HTN) with a percentage of 24.58%, diabetes mellitus (DM) with 33.25%, anemia with 8.67%, chronic kidney disease (CKD) accounting for 17.12%, atrial fibrillation with 7.67%, deep vein thrombosis (DVT) with 2.22%, and urinary tract infection (UTI) with 3.22%.

Table 4. Main Cause of Hospitalization due to co-existing diseases.

Main Cause of Hospitalization	Number of Patients	Percentage
HTN	8	24.58%
DM	10	33.25%
ANEMIA	3	8.67%
CKD	5	17.12%
Atrial fibrillation	2	7.67%
DCM	1	3.22%
UTI	1	3.22%
DVT	2.22	2.22%
Total	31	100%

**Figure 3.** Main cause of hospitalization due to concurrent diseases.

DISCUSSION

The project study was conducted at the Cardiology Department of Pakistan Institute of Medical Sciences (PIMS) in Islamabad, Pakistan. A total of 20 patient histories were recorded, encompassing chief complaints, lab tests, diagnosis, concurrent diseases, side effects, adverse drug reactions (ADRs), drug interactions, and drug-related problems. The study included patients admitted to the cardiology ward diagnosed with heart failure (HF), left ventricular failure (LVF), right ventricular failure (RVF), or a combination of both. The collected patient histories were regularly analyzed, comparing them with standard guidelines from various sources such as the British National Formulary (BNF), online drug information, Stockley's Drug Interactions Handbook, and Medscape Drug Interaction.

Contrary to previous research indicating a higher prevalence of HF in women, this study found that males with HF outnumbered females. The prevalence of LVF over other forms of diastolic dysfunction served as an example of HF. A total of 60 drugs were identified as contraindicated for these patients, while some drugs required careful monitoring of their profiles. A few drugs were flagged as needing assessment for the patient, leading to irrational use. Common medication-related errors identified included

drug administration without proper indications, improper drug selection, ADRs, drug interactions, patient noncompliance, drugs requiring dosage adjustments, therapeutic duplication, selection of inappropriate dosage forms, prescription of narrow therapeutic drugs without adequate monitoring, polypharmacy, and cost-related issues.

Out of the 60 drug-related errors identified, the most prominent was drug interactions, accounting for 56.66% of cases. This occurred when prescribers prescribed two drugs simultaneously that interacted with each other. Some medications were prescribed unnecessarily, resulting in polypharmacy and increased financial burden on patients. The ratio of polypharmacy detected in the study was 8.88%. Narrow therapeutic index drugs, which require close monitoring due to their potency, accounted for 5.55% of cases, but no tests were performed to monitor their use.

Some prescribers opted for cost-effective drugs, which patients were unable to afford. Therapeutic duplication was the most common medication error observed, with a ratio of 2.22%. The primary causes of HF were found to be diabetes and hypertension, with 33.35% and 25.80% of patients, respectively, having these conditions along with HF. HF most commonly occurred in elderly individuals, particularly those aged between 51 and 60 years.

CONCLUSION

There were numerous issues related to prescription practices, particularly concerning Chronic Renal Failure patients. These issues included irrational dose adjustments, polypharmacy, drug duplication, adverse drug reactions (ADR), cost-related problems, lack of alternative therapies, and inadequate monitoring of medications with narrow therapeutic indexes. These problems arise due to a lack of qualified pharmacists in the healthcare system and prescribers' insufficient knowledge about drug usage. Consequently, medication errors are increasing, leading to a higher risk of ADRs and toxicities. Resolving these issues requires healthcare facilities to establish and provide access to clinical pharmacists and hospital pharmacists in all areas of the hospital, including drug and poison information centers, inpatient and outpatient departments, and wards. This will help reduce errors. Furthermore, to improve patients' health quickly and effectively, a well-coordinated system among all healthcare professionals is essential. Often, patients make mistakes because they lack proper knowledge on how to use their medications correctly. Therefore, pharmacists should provide counseling to patients in the hospital wards, outpatient settings, and community pharmacies to enhance medication understanding and adherence.

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Conflict of Interest

The author claiming no conflict of interest.

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