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PREVALENCE AND DETERMINANTS OF CONGESTIVE HEART FAILURE IN HYPERTENSIVE PATIENTS ATTENDING HEALTH FACILITIES IN PAKISTAN

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Abstract

The objective of this study was to determine the prevalence and associated risk factors of congestive heart failure (CHF) among hypertensive patients attending selected health facilities in Pakistan. The specific objectives were to assess the prevalence of CHF, identify risk factors contributing to its development, and evaluate health service delivery–related factors associated with CHF among hypertensive patients in selected Pakistani hospitals. Although several studies have been conducted globally on CHF, limited published research exists in Pakistan focusing on hypertensive patients. This study therefore aimed to provide insight into the disease burden and determinants of CHF in this population.

The study population consisted of patients attending Medical Outpatient Clinics (MOPC) weekly and key informants. The total sample size was 239. Data were collected using structured questionnaires and key informant interviews after obtaining written informed consent. Interviews were conducted in private consultation rooms to ensure confidentiality. Quantitative data were analyzed using means, percentages, and standard deviations to summarize findings and estimate the prevalence of CHF among hypertensive patients. Chi-square and logistic regression analyses were applied to determine associations and predictors between risk factors and health service–related variables (independent variables) and CHF development (dependent variable). Qualitative data were analyzed thematically.

The study findings revealed a CHF prevalence of 9.6% among hypertensive patients attending selected health facilities in Pakistan. Significant risk factors associated with CHF development included physical activity level ($p=0.016$), duration of sitting and travel time ($p=0.042$), and BMI ($p=0.0001$). Health service delivery factors significantly associated with CHF were availability of antihypertensive medications ($p=0.003$), appropriate scheduling of CHF clinic follow-ups ($p=0.009$), and availability of CHF risk factor screening services ($p=0.001$).

The study concluded that modifiable lifestyle factors and all the examined health service delivery–related factors were significantly associated with CHF development. It is recommended that health authorities in Pakistan develop *targeted strategies to reduce CHF prevalence by addressing modifiable risk factors, improving medicine availability, and strengthening follow-up and screening systems within health facilities.*

INTRODUCTION

Congestive Heart Failure (CHF) affects over 26 million people globally and is a major cause of morbidity and mortality, with an estimated cost exceeding USD 100 billion in 2012 (1). Mortality from CHF is higher in low- and middle-income countries than in developed regions (2). In developing countries like Pakistan, CHF remains a leading cause of cardiovascular disease and hospitalization (3, 4). Hypertension, cardiomyopathy, and rheumatic heart disease are among the primary etiologies (5).

Hypertension is a significant risk factor for CHF, as most patients with heart failure have a history of elevated blood pressure (6). Persistent hypertension leads to diastolic dysfunction and concentric left ventricular hypertrophy, ultimately progressing to CHF with preserved ejection fraction (7).

In Pakistan, there is limited published research on CHF prevalence and risk factors among hypertensive patients (8). This study therefore aimed to determine the prevalence and determinants of CHF among hypertensive patients attending selected health facilities in Punjab Province, providing data to guide prevention and management strategies.

In Pakistan, hypertension contributes substantially to cardiovascular morbidity, with prevalence estimates exceeding 25% (9). CHF is one of the most common complications of uncontrolled hypertension, yet many patients present late, leading to poor outcomes and high treatment costs. Despite its burden, few studies have examined CHF prevalence and related risk factors among hypertensive patients in Pakistan (10). This research addresses that gap.

Given Pakistan's growing burden of hypertension and cardiovascular diseases, understanding the relationship between hypertension and CHF is essential. Identifying modifiable risk factors will help reduce CHF prevalence and improve healthcare delivery. This study provides evidence-based insights to inform preventive strategies and optimize hypertension management in health facilities.

OBJECTIVES

1. To determine the prevalence of congestive heart failure among hypertensive patients attending selected health facilities in Punjab.
2. To identify risk factors associated with CHF development in hypertensive patients.
3. To assess health service delivery factors related to CHF occurrence among hypertensive patients.

MATERIALS AND METHODS

Study Design

A cross-sectional study combining quantitative and qualitative methods.

Variables

Independent variables: Modifiable (smoking, alcohol, BMI, diabetes, physical inactivity), non-modifiable (age, sex, family history), and healthcare delivery factors (medicine availability, follow-up scheduling, CHF screening).

Dependent variable: Presence of CHF confirmed through clinical diagnosis and medical records.

Study Setting

Conducted in medical outpatient departments of two hospitals in Punjab one public and one private both managing large numbers of hypertensive patients weekly.

Sample and Sampling

The study population comprised hypertensive adults attending outpatient clinics. A sample of **239 participants** was determined using Fisher's formula with a 10% adjustment for non-response. Hospitals were selected purposively, and patients sampled proportionally to clinic attendance.

Data Collection

Semi-structured questionnaires and key informant interviews were used. Two trained assistants helped administer the tools in Urdu and English. Data covered demographics, clinical history, lifestyle factors, and healthcare service access.

Data Analysis

Quantitative data were analyzed using descriptive (means, percentages) and inferential statistics (Chi-square and logistic regression) to identify associations between risk factors and CHF. Qualitative data were thematically analyzed to support quantitative findings.

RESULTS

This chapter presents the results and data analysis using both quantitative and qualitative methods to address the study objectives. Out of 240 respondents, 229 (95.4%) provided complete responses and were included in the analysis, while 11 (4.6%) were excluded due to incomplete or inconsistent data. The response rate is acceptable, as rates above 50% are considered suitable for analysis.

Socio-demographic characteristics of respondents

The respondents' mean age was 66.6 years (SD = 12.8), with most aged 60–69 years. At Punjab Institute of Cardiology, 29.4% were in this age group, and at Mayo Hospital, 28.3% ($p = 0.005$). Females accounted for 55% overall (Punjab Institute of Cardiology: 57.8%; Mayo Hospital: 52.8%). Most respondents had primary-level education or below (Punjab Institute of Cardiology: 48%; Mayo Hospital: 69%). The majority were married (65.9%), Christian (75.5%), and unemployed (57.2%).

Table 4. 1: Demographic characteristics of hypertensive patients attending Punjab Institute of Cardiology and Mayo Hospital in Lahore, Pakistan

Characteristics	Punjab Institute of Cardiology			Mayo Hospital	
	Total n=102		Percent	n=127 Percent	
Age (μ=66.6, σ =12.8) Less than 50 years	44(19.2%)	18	17.6%	26	20.5%
50-59 years	54(23.6%)	24	23.5%	30	23.6%
60-69 years	66(28.8%)	30	29.4%	36	28.3%
70-79 years	39(17.0%)	17	16.7%	22	17.3%
80 years and above	26(11.4%)	13	12.7%	13	10.2%
Gender Male	103(45.0%)	43	42.2%	60	47.2%
Female	126(55.0%)	59	57.8%	67	52.8%
Level of education No formal education	42(18.3%)	18	17.6%	24	18.9%
Primary	95(41.5%)	31	30.4%	64	50.4%
Secondary	69(30.1%)	35	34.3%	34	26.8%
Tertiary	23(10.0%)	18	17.6%	5	3.9%
Religion Christian	173(75.5%)	68	66.7%	105	82.7%
Muslim	56(24.5%)	34	33.3%	22	17.3%

Marital Status Single	47(20.5%)	20	19.6%	27	21.3%
Married	151(65.9%)	67	65.7%	84	66.1%
Separate/Divorced	14(6.1%)	7	6.9%	7	5.5%
Widowed	17(7.4%)	8	7.8%	9	7.1%
Employment status Formal employment	33(14.4%)	14	13.7%	19	15.0%
Informal employment	65(28.4%)	26	25.5%	39	30.7%
Not employed	131(57.2%)	62	60.8%	69	54.3%
Area of residence Urban	84(36.7%)	41	40.2%	43	33.9%
Rural	145(63.3%)	61	59.8%	84	66.1%

Prevalence of Congestive Heart Failure

The results showed that out of 229 respondents, 22 (9.6%) had congestive heart failure, with a prevalence of 8.8% at Punjab Institute of Cardiology, Lahore and 10.2% at Mayo Hospital, Lahore (Figure 4.1).

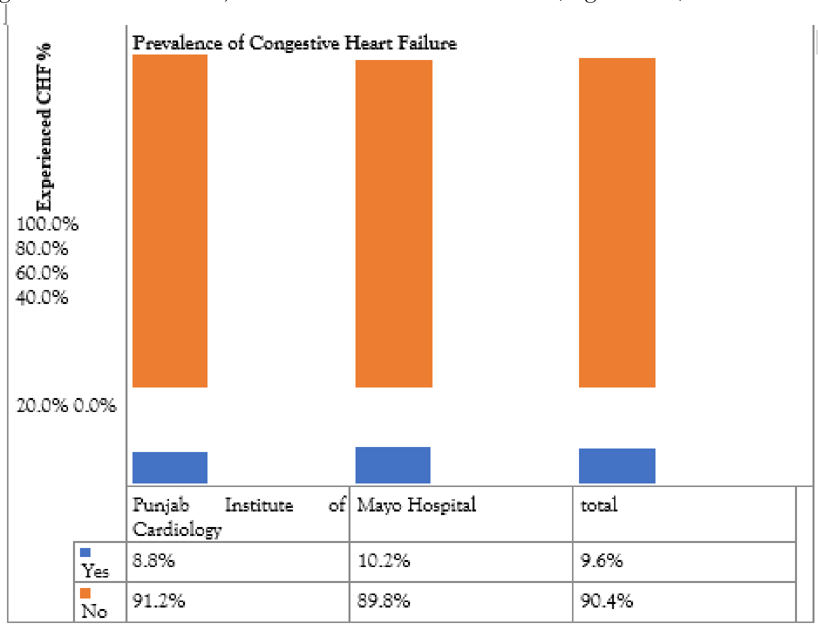

Figure 4. 1: Prevalence of Congestive Heart Failure among hypertensive patients attending selected hospitals in Punjab, Pakistan

This finding contrasts with key informant reports, which suggested a slightly higher CHF prevalence. "Congestive heart failure (CHF) is a significant public health issue here, with approximately 10–15% of patients affected" (KI 1). Another informant estimated, "I don't have exact figures, but around 10–18% of hypertensive patients are affected" (KI 2).

Classification of Congestive Heart Failure

The results showed that out of 229 respondents, a more than half of respondents (60%) had NYHA Class 1 of CHF, 38% had NYHA Class 11 of CHF, 2% had NYHA Class 111 and no respondent had NYHA Class IV (Figure 4.2)

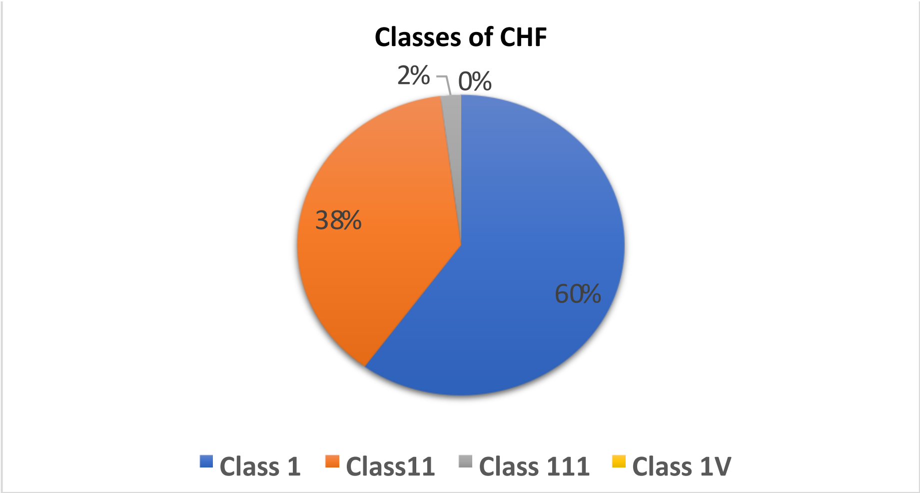

Figure 4. 2: Classification of Congestive Heart Failure among hypertensive patients attending hospitals in Punjab, Pakistan

Risk Factors Associated with Congestive Heart Failure

Risk factors were grouped as modifiable (smoking, alcohol, comorbidities, lifestyle, activity level, sedentary time, recent weight change, BMI), non-modifiable (family history of CHF), and socio-demographic (age, gender, marital status, education).

Modifiable risk factors

Modifiable risk factors among hypertensive patients diagnosed with CHF showed that 59.1% were overweight or obese, 27.3% spent over 4 hours per week sitting or travelling, 22.7% had a weight increase in the past six months, 50% engaged in mild physical activity, 45.5% reported smoking or alcohol use, 31.8% had comorbidities (DM or CAD), and 54.5% received lifestyle advice. Significant associations with CHF development were observed for BMI (χ^2=19.687; p=0.0001), activity level (χ^2=7.291; p=0.016), and time spent sitting/travelling (χ^2=5.855; p=0.042) (Table 4.2).

Table 4. 2: Modifiable Risk Factors Associated with Congestive Heart Failure among Hypertensive Patients at Punjab Institute of Cardiology and Mayo Hospital, Punjab, Pakistan

CHF Variable	Yes n (%)	No n (%)	Significance
BMI Normal weight	9(40.9%)	98(47.3%)	**χ^2=19.687; df**
Overweight and obese	13(59.1%)	109(52.7%)	**1; p=0.0001**
Time spent sitting &travelling/ we Less than 4 hours	**ek** 16(72.7%)	110(53.1%)	**χ^2=5.855; df 1;**
4 hours +	6(27.3%)	97(46.9%)	**p=0.042**
Weight trend (6 months) Increasing	5(22.7%)	57(27.5%)	χ^2=3.574; df 1;

Decreasing	17(77.3%)	150(72.5%)	p=0.097
Activity level			
Vigorous	6(27.3%)	11(5.3%)	
Moderate	5(22.7%)	112(54.1%)	**x^2=7.291; df 2; p=0.016**
Mild	11(50.0%)	84(40.6%)	
Risky behavior (smoking and alcohol)			
Yes	10(45.5%)	77(37.2%)	x^2=2.103; df 1;
No	12(54.5%)	130(62.8%)	p=0.120
Concomitant diseases (DM, CAD)			
Yes	7(31.8%)	55(26.6%)	x^2=1.007; df 1;
No	15(68.2%)	152(73.4%)	p=0.652
Lifestyle advice (diet, weight management, smoking &exercise)			
Yes	12(54.5%)	133(64.3%)	x^2=1.848; df 1;
No	10(45.5%)	74(35.7%)	p=0.095

KIIs supported the link between higher BMI and CHF and suggested associations with smoking, alcohol, and low activity, though quantitative analysis only confirmed BMI.

"CHF among hypertensive patients is common in obese patients, heavy smokers, and alcohol drinkers" (KI 1).

"Activity levels are strongly associated with CHF" (KI 3).

Non-modifiable risk factors

Ten respondents (45.5%) that developed CHF had a family history of CHF. This was almost equivalent to the respondents that didn't develop CHF but also had family history of CHF. Family history did not appear to show any significant association with development of CHF (Table 4.3).

Table 4.3: Association of Family History with Congestive Heart Failure among Hypertensive Patients Attending Punjab Institute of Cardiology and Mayo Hospital in Punjab, Pakistan

Congestive heart failure **Variable**	**Yes (n %)**	**No (n %)**	**Significance**
Family history of CHF			
Yes	10(45.5%)	83(40.1%)	x^2=1.097; df 1; p=0.243
No	12(54.5%)	124(59.9%)	

This finding contrasts with the views expressed in the key informant interviews, where one respondent suggested a possible link between family history and CHF development. "Most cardiovascular diseases, including hypertension, tend to run in families, so it is very likely that a family history of CHF increases an individual's risk of developing the condition." (KII 3)

Socio-demographic risk factors

Logistic regression analysis was conducted to assess socio-demographic risk factors for CHF development among hypertensive patients attending MOPC. Most CHF cases occurred among females (59.1%) and individuals aged 60 years or older (72.7%), who were about twice as likely to develop CHF (OR=1.6; 95% CI=1.95–4.43; p=0.185). Over half of the affected respondents were single (54.5%), and 63.6% had formal education. However, none of the socio-demographic factors showed a statistically significant association with CHF development (Table 4.4).

Table 4. 4: Socio-demographic risk factors associated with Congestive Heart Failure among hypertensive patients attending selected health facilities in Punjab

Variable	CHF		OR (95% CI)	p-value
	Yes n (%)	**No n (%)**		
Gender				0.368
Male	9(40.9%)	94(45.4%)	1.2(1.49-5.52)	
Female	13(59.1%)	113(54.6%)	Reference	
Age (μ=66.6, σ =12.8)				0.185
Less than 60 years	6(27.3%)	92(44.4%)	Reference	
60 years and above	16(72.7%)	115(55.6%)	1.6(1.95-4.43)	
Marital Status				
Single	12(54.5%)	66(31.9%)	Reference	0.917
Married	10(45.5%)	141(68.1%)	0.99(1.73-7.44)	
Level of education				0.261
No formal education	8(36.4%)	34(16.4%)	Reference	
Formal education	14(63.6%)	173(83.6%)	1.3(0.48-5.61)	

This finding contrasts with insights from the key informant interviews, where one respondent suggested a likely association between age and CHF development: "Many CHF patients are elderly, and it appears that as one grows older, the risk of developing CHF increases" (KI 1).

Health service delivery related factors

Fourteen respondents (63.6%) who developed CHF reported the availability of essential hypertension medicines in the hospital, while half (50%) had scheduled hypertension clinic follow-ups. Additionally, thirteen respondents (59.1%) reported access to screening services for CHF risk factors. All examined health service delivery factors availability of hypertension medicines (χ^2=6.627; p=0.003), scheduled clinic follow-ups (χ^2=10.385; p=0.009), and availability of screening services (χ^2=7.766; p=0.001) showed a significant association with the development of CHF (Table 4.5).

Table 4. 5: Health service delivery related factors associated with congestive heart failure among hypertensive patients attending selected health facilities in Punjab.

Variable	Congestive heart failure Yes (n %)	No (n %)	Significance
Availability of medicine			
Yes	14(63.6%)	129(62.3%)	**χ^2=6.627; df 1; p=0.003**
No	8(36.4%)	78(37.7%)	
Scheduled clinic follow-up			
Yes	11(50.0%)	138(66.7%)	**χ^2=10.385; df 1; p=0.009**
No	11(50.0%)	69(33.3%)	
Availability of screening services			
Yes	13(59.1%)	132(63.8%)	**χ^2=7.766; df 1; p=0.001**
No	9(40.9%)	75(36.2%)	

Key informant interviews supported these findings, noting poor adherence to follow-up visits, especially among elderly patients living far from hospitals and facing financial constraints. “Most patients are elderly, live below the poverty line, and often skip follow-ups due to high treatment and transport costs” (KI 1).

Most informants confirmed the availability of antihypertensive drugs, though some classes — such as calcium channel blockers and certain angiotensin receptor blockers — were occasionally out of stock. “Around 90% of medicines are usually available, though some combinations are not regularly stocked” (KI 4).

Clinicians also cited the lack of structured follow-up systems, pill burden, and limited community support for older adults as contributors to CHF. “Many facilities lack specific clinic follow-ups, and patients struggle with multiple medications” (KI 5).

Additionally, high costs and preparation requirements for diagnostic tests were reported as barriers to CHF detection. “Some patients can’t afford screening tests or find them difficult due to fasting requirements” (KI 6).

Discussion

This study found a relatively low prevalence of Congestive Heart Failure (CHF) among hypertensive patients attending selected health facilities in Punjab, Pakistan, compared with findings from some African countries where prevalence rates have exceeded 40% (11). The lower rate observed may reflect differences in lifestyle, awareness, and access to healthcare.

Most respondents were rural residents who tend to engage in more physical activity, such as walking or manual labor, which likely contributed to the lower CHF prevalence. Physical inactivity has been strongly linked to CHF development (12).

A slightly higher prevalence of CHF was found among women than men, consistent with prior studies showing that women are more likely to develop heart failure with preserved ejection fraction (13). Early-stage CHF (NYHA Class I–II) was the most common presentation, suggesting timely diagnosis and opportunities for prevention through early intervention.

High Body Mass Index (BMI) was significantly associated with CHF among hypertensive patients, consistent with global evidence showing that obesity increases cardiac workload and risk of heart failure (14). Regular physical activity, healthy dietary habits, and weight control remain essential preventive measures (15).

Physical inactivity was another major contributor. Patients with sedentary lifestyles or limited physical exercise showed higher CHF prevalence, reinforcing the importance of moderate activity (150 minutes per week) in controlling blood pressure and maintaining cardiac health (16).

Community-level interventions such as awareness campaigns on physical activity, heart-healthy diets, and reduced salt and sugar intake are crucial. Policies promoting walkable infrastructure, recreational spaces, and public transport use can also encourage physical activity.

Availability of antihypertensive medications was significantly linked to CHF prevention. Inconsistent supply of essential drugs or high costs can reduce adherence and worsen disease control (17). Hospitals should ensure regular stock management, subsidized medicine costs, and patient feedback systems.

Regular follow-up visits for hypertensive patients were also protective, as they improve treatment adherence, monitoring, and early detection of CHF symptoms (18). Screening services for CHF risk factors such as ECG, lipid profile, and renal function tests were another crucial determinant. Expanding access to affordable diagnostic services can support early intervention and reduce complications.

Conclusion and Recommendations

The prevalence of congestive heart failure (CHF) among hypertensive patients attending selected health facilities in Punjab was approximately 9–10%, reflecting a manageable yet significant public health burden. The findings indicate that modifiable factors such as high body mass index (BMI), physical inactivity, and unhealthy lifestyle habits are major contributors, emphasizing that CHF is largely preventable through behavioral and lifestyle interventions. Additionally, health service delivery factors including consistent availability of antihypertensive medications, regular patient follow-up, and accessible screening services play a crucial role in influencing CHF development. Therefore, it is recommended that the Provincial Health Department strengthen community-based programs targeting modifiable risk factors like obesity and inactivity, ensure hospitals and primary healthcare centers maintain a continuous supply of essential antihypertensive drugs and affordable diagnostic services, and implement structured follow-up systems for hypertensive patients to improve disease monitoring and prevent progression to CHF.

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