



## **Risk Factors of Heart Failure among the Patients Suffering from Hypertension Attending a Hospital in Islamabad, Pakistan**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

**Objective:** To determine the risk factors of heart failure (HF) in the hypertensive cases attending the cardiology unit of tertiary care Hospital.

**Methods:** This Case-Control study was conducted from April 2020 to May 2021 at the Pakistan Institute of Medical Sciences, Islamabad. One hundred (100) patients of sex - and age -matched pairs were included in the study. Adults clinically diagnosed as cases of Hypertensive heart failure (HF) and individuals having systemic hypertension but no HF (controls) were included in the study. Cardiovascular risk factors were assessed by the questioner. Assessment of the study variables was done and the data analysis was carried out using SPSS version 26.

**Results:** A total of one hundred (100) cases and 100 cases as controls were studied. The average age of the study subjects (cases) was 38.4±9.28 years and 38.35±9.04 years of controls. Males were in majority in both groups. Obesity, renal impairment and hypertension in the first degree relative were higher in the hypertensive heart failure in contrast to controls. Average proteinuria and serum creatinine level were higher among study subjects compared to controls (p<0.05). Medication adherences were considerably higher among the subjects in the control group than in the subjects of case group. Hypertension control group members were more inclined to eat vegetables and fruits on a daily basis, whereas no significant difference was found in the consumption of the salt between the cases and controls. History of anti-hypertensive drugs intake,

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lower intake of vegetables and fruits, and medication adherence represented the highest levels amongst the risk factors.

**Conclusion:** In the conclusion of current study, the particular lifestyle, poor dietary habits, medication adherence, and lack of exercise were observed to be the commonest risk factors of heart failure. Awareness programs should be expanded in general and specialty health care settings.

*Keywords:* Heart failure; high blood pressure; risk factor.

## 1. INTRODUCTION

The worldwide population represents a serious health problem.[1] It is linked to several clinical disorders and can impair the brain, heart, lungs, and kidneys, as well as induce end-organ failure [1]. Hypertension is among the primary causes of cardiovascular disease, cardiovascular-related global morbidity & mortality, accounting for nearly 7.6 million deaths each year globally [1]. Hypertension is also among the primary risk factors for heart failure (HF) worldwide, particularly in Pakistan [2, 3].

Despite advancements in the management of patients being affected by systemic hypertension and the emergence of effective anti-hypertensive drugs, prevalence of HF resulting from hypertension tends to increase in Pakistan [2, 3]. In the Pakistani demographics, hypertensive heart failure (HHF) mostly affects adults, resulting in a loss of expertise and low standard of living [5, 6]. In recent years, epidemiological investigation for the heart failure risk factors in the general populace has continued although a very little is known regarding the significant risk factors of heart failure. The majority of researches conducted in Pakistan were descriptive studies. Whereas the risk factors of the cardiovascular events are common in people of all ages, the specific risk factors that cause HHF have yet to be identified [7]. Understanding the risks and predictors of HF in at-risk groups is essential for a preventive healthcare strategy to reduce the epidemic of HF in cases with hypertension. As a result, it is necessary to identify and depict the heart failure risk factors in Pakistan. The RISK-HHF investigation is a case-control research study that aims to identify and characterize risk factors for hypertensive HF in Pakistan. This study aims to assess the strength of relateness between Hypertensive heart failure (HF) and different modifiable risk factors of cardiovascular events, as well as to identify the specific blend of risk factors accountable for overall HF risks among Pakistani hypertensive patients who are susceptible to low-cost cardiovascular prevention.

## 2. MATERIAL AND METHODS

This cross-sectional study was done at medicine and cardiology department of Pakistan Institute of Medical Sciences, Islamabad. The study duration was 12 months from May 2020 to April 2021. All the patients with age of 28 years or older, with clinically diagnosed hypertension-induced Heart failure and hospitalized for the first time and either of gender were included, whereas for the controls, inclusion criteria included a previously diagnosed case of asymptomatic hypertension or a diagnosis of HF and their first visit to the cardiology clinic. Patients having systemic hypertension without heart failure had just been referred to the clinic of cardiology for therapy continuation throughout the research duration was selected. In a 1:1 ratio, the controls and cases were enrolled. All the cases and controls those having HF due to another cause, had a previous myocardial infarction or ischemic cardiac disease history, chronic obstructive pulmonary disease (COPD) and pregnant women were excluded. Complete medical history, clinical examination and echocardiography was done to assess the heart failure. A questionnaire-based Performa was used to collect data, and responses were confirmed using clinical notes. A venous blood specimen (5ml) was drawn from all individuals, and serum creatinine and serum urea were determined. A urine specimen of 10 mL was collected from each case for the analysis of urine. Proteinuria was considered as significant where trace proteinuria on dipstick were more than the standard. All the demographic information, including suspected risk factors for the heart failure were documented via questionnaire- based study proforma. Data was analyzed using SPSS version 20.

## 3. RESULTS

A total of one hundred (100) cases were studied. The overall average age of the study cases was  $38.4 \pm 9.28$  years (cases) and  $38.35 \pm 9.04$  years of controls. Males were in majority in both groups.

Hypertensive heart failure cases showed higher respiratory rates but lower blood pressures (systolic & diastolic) compared to controls. Statistically insignificant difference was seen between the both groups in terms of pulse rate. Obesity levels, renal impairment and hypertension in the first degree relative were higher in the hypertensive heart failure than the control group. However, diabetes was higher in the subjects of the control group and the biochemical profile of both groups is also represented in Table 1.

Medication adherences were considerably higher among the subjects of the control group than the subjects of the case group. The participants of the control group were more likely to have been on antihypertensive medicines regularly than the individuals who developed hypertensive heart failure (cases) (Table 2).

Hypertension control group members were more inclined to eat vegetables and fruits on the daily

basis compared to hypertensive heart failure (cases) individuals. However, there was no significant difference in the salt consumption between the cases (4.7) and controls (4.73).

The history of anti-hypertensive drugs intake, daily lower intake of vegetables and fruits, and medication adherence represented the highest levels amongst the risk factors. Medication observance showed 67%, followed by daily fruits and vegetables with 46%. Proteinuria was declared as 20%, while eGFR displayed negligible level of 5.3%. Fig. 1.

Hypertension control group members were more inclined to eat vegetables and fruits on a daily basis, whereas no significant difference was found in the consumption of the salt between the cases and controls. History of anti-hypertensive drugs intake, lower intake of vegetables and fruits, and medication adherence represented the highest levels amongst the risk factors.

**Table 1. Baseline characters of study participants n=200**

Variables	Cases (n=100)	Controls (n=100)	P- Value
Age	38.4±9.28	38.35±9.04	0.944
BMI	26.1±3.09	25.9±2.9	0.016
SBP	121.5±7.16	129.75±11.64	0.017
DBP	81.9±7.64	90.4±10	0.072
Respiratory Rate	21.2±2.5	19.58±2.86	0.154
Gender	Male	62(62.0%)	74(74.0%)
	Females	38(38.0%)	26(26.0%)
Marital Status	Married	81(81.0%)	62(62.0%)
	Un-Married	19(19.0%)	38(38.0%)
History of diabetes	21(21.0%)	35(35.0%)	0.05
Obesity	14(14.0%)	10(10.0%)	
Renal impairment	25(25.0%)	10(10.0%)	0.03
Proteinuria	42.3±5.4	11.9±2.8	
Serum Urea	33.8±3.5	34.2±3.57	0.01
Serum Creatinine	1.1±0.28	0.9±0.25	0.46
eGFR	70.3±4.4	90.0±6.66	0.06

**Table 2. Lifestyle risk factors in the participants n=200**

Variables	Cases (n=100)	Controls (n=100)	P- Value
Exercise	Not at all	32(32.0%)	20(20.0%)
	Occasional	47(47.0%)	25(25.0%)
	As recommended	1(18.0%)	55(55.0%)
Smoking	Never	15(15.0%)	41(41.0%)
	Occasional	44(44.0%)	44(44.0%)
	Continues smoker	38(38.0%)	15(15.0%)
Medication adherence	High	22(22.0%)	43(43.0%)
	Medium	28(28.0%)	27(27.0%)
	Low	50(50.0%)	30(30.0%)
Estimated salt intake per day (grams)	4.7±1.2	4.73±1.2	0.01
Fruit & Vegetable Intake	Daily	23(23.0%)	50(50.0%)
	Weekly	38(38.0%)	35(35.0%)
	Monthly	39(39.0%)	15(15.0%)

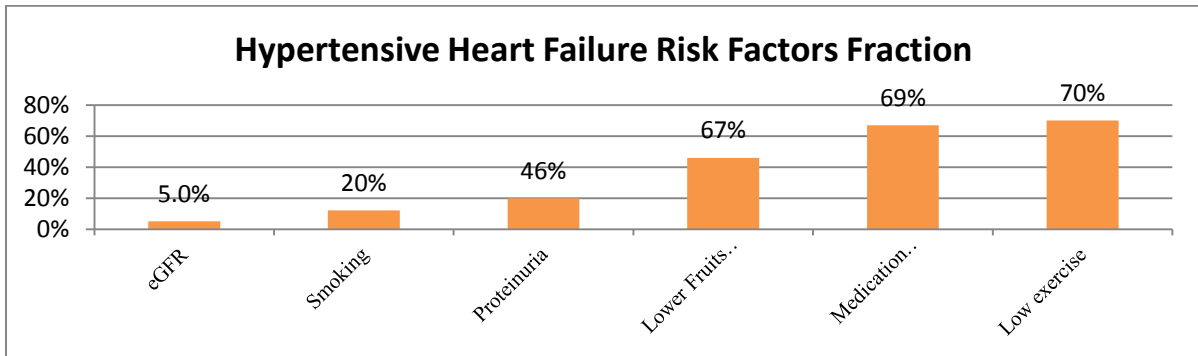


Fig. 1. Risk factors of heart failure among hypertensive individuals n=100

#### 4. DISCUSSION

In this study, mean age of study cases was  $38.4 \pm 9.28$  years and mean age of study controls was  $38.35 \pm 9.04$  years. This is in accordance with the findings by Almas A et al. [8] as they demonstrated that the average age was  $39.4 \pm 8.28$  years and  $39.65 \pm 6.04$  among patients with hypertensive HF and controls, respectively. In this study, males were in majority in both groups and these findings were similar to the study of Shaikh ZA et al [6] as they found that the males were in majority. In this study the continues smokers were in majority in HF cases 38(38.0%) compared to controls. The rate of smoking is in line with other research epidemiologic studies in the over-all population and also in hypertensive and heart failure patients [9]. Cigarette smoke is a vasculotoxic, atherogenic, and pro-inflammatory mediator triggering the cytokines release that activates the Renin-Angiotensin-Aldosterone System (RAAS) with subsequent myocardial toxicity, adverse hemodynamics and depression [9]. Interestingly, in this study the smoking was not observed as a significant risk factor for heart failure and these findings were similar to the study of Oguntade AS et al. Dietary habits should be mentioned in the title role. Despite the fact that daily vegetable and fruit consumption fell just short of statistical significance ( $p < 0.05$ ) in association analysis, the conclusion is clinically significant. In the study by Rautiainen S FH et. al [10], observed that the high uses of vegetables and fruits was inversely linked to the heart failure prevalence. On other hand Karppi J et al [11] conducted a population-based study on 1031 males with age range of 46 - 65 years and they observed that the male in the lowest quartile of  $\alpha$ -carotene had a nearly three-fold higher risk of CHF. The individuals' salt intake was within the acceptable levels. Excessive salt consumption in the general

population increases Glomerular filtration rate (GFR), blood volume, and may aggravate or precipitate hypertension in susceptible people. Given the ascertainment bias in assessing dietary consumption of vegetables, fruits, and salt, it is difficult to get a conclusion on the title role of dietary behaviors in hypertensive heart failure [12]. In this study, less than 50% of individuals in each group exercised in some way. Sedentary lifestyles and insufficient exercise have been identified as risk factors for cardiovascular disease in the general populace. It has been shown that performing aerobic exercise of moderate-intensity fewer than 150 minutes per week predisposes to dyslipidemia and obesity, which leads to cardiovascular deconditioning and insulin resistance [13,12]. Surprisingly, neither diabetes nor obesity were linked to an increased risk of hypertensive HF in this research. In Pakistan, further research is needed to determine the impact of exercise in the risk of HHF. In the current study, high medication adherence was low (22%) in the study cases and high (43%) in study controls, who had been diagnosed as hypertensive cases for a long time. Proteinuria, serum creatinine, serum urea, and approximated glomerular filtration rate all had a significant correlation with the risk of HHF. In the present study proteinuria was significantly raised in cases ( $42.3 \pm 5.4$ ) as compared to the controls ( $11.9 \pm 2.8$ ). Mueed A et al. [14] have also revealed that even after controlling for risk factors of the cardiovascular diseases, proteinuria is a major indicator of the cardiac diseases among patients of heart failure. In this series in the case group the average of systolic and diastolic blood pressure was lower as ( $121.5 \pm 7.16$  and  $81.9 \pm 7.64$  respectively), although having a greater respiratory rate ( $21.2 \pm 2.5$ ), which is consistent with chronic sympathetic HF, which leads in poorer

cardiovascular fitness in the long term. In the present series, the overweight was not related to the heart failure, where it was highly prevalent in both the groups (cases and controls). This is conflicting to the study and other published studies by Oguntade AS et al. [12] and Levy D et al. [15]. The 'obesity paradox has been attributed to thinness in HF patients.[16] In conclusion, the significant unfavorable risk factors of HF among hypertension cases in this study were proteinuria levels and poor medication adherence, whereas the protective risk factors were approximate glomerular filtration rates and daily consumption of vegetable and fruits. The study's strengths include the matching of cases and controls, which decreases the confounders of age and gender in HF risk. Another feature of this study is the implementation of an authorized medication adherence questionnaire, which reduces subjectivity in patient categorization. Furthermore, the risk variables identified in this study might serve as a focus for community health preventative activities. As per study observations, hypertensive individuals were on high risk of heart failure. Furthermore, the prevalence of ischemic cardiac disease in Pakistan remains low, and hypertension still accounts for the majority of heart failure episodes in our demographics. This was a small sample size and single center study with several limitations, hence further large-scale studies are recommended on this subject.

## 5. CONCLUSION

In the conclusion of current study, the particular lifestyle and poor dietary habits, medication adherence, and lack of exercise were observed to be the commonest risk factors of heart failure. Awareness programs should be expanded in general and specialty health care settings.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

As per international standard or university standard ethical approval has been collected and preserved by the authors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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