RISK FACTORS OF HEART FAILURE AMONG THE PATIENTS OF HYPERTENSION ATTENDING A HOSPITAL IN ISLAMABAD, PAKISTAN: THE RISKS OF HYPERTENSIVE HEART FAILURE A CASE-CONTROL STUDY

ABSTRCAT

Objective: The aim of this study was to illustrate the risk factors of heart failure (HF) among patients of hypertension attending the cardiology clinic of hospital.
Methods: This Case-Control study was conducted from 1 April, 2020 to 1 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 research. There interview was taken and cardiovascular risk factors were assessed. Assessment of the study variables was done and the data analysis was carried out using SPSS (IBM) 21.
Results: The mean age of the study subjects was 38.4±9.28 years (cases) and 38.35±9.04 years (controls) both groups had males in majority. There was no significant variance in the family history obesity, diabetes and of hypertension between study group and control group. Medication observance was expressively higher among the controls than the cases (*p*-value 0.01). Increased fruits and vegetables consumption were seen in the controls than the cases (p-value 0.05).
Conclusion: The Hypertensive Heart Failure associated risk factors are responsive to dietary modifications and lifestyle. Common health and preventative cardiovascular care strategies, such as encouraging vegetables and fruit consumption and reducing smoking among individuals with hypertension, are recommended.

Keywords: Heart Failure, Myocardial Failure, High Blood Pressure, Hypertension

Introduction

Hypertension, which affects 30% of the worldwide people, is considered a serious health problem. Hypertension is linked to a variety of 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 factor for heart failure (HF) worldwide, particularly in Pakistan, where 61% and 75.7 % cases of HF were reported in one cohort from Karachi and another cohort from Islamabad, respectively [2, 3]. Despite advancements in the management of patients suffering from systemic hypertension and the emergence of effective anti-hypertensive drugs, the prevalence of HF resulting from hypertension tends to increase in Pakistan [2, 3]. In the Pakistani demographic, hypertensive heart failure (HHF) mostly affects the adults, resulting in loss of expertise and lower standard of living [5, 6]. HHF patients, by definition, have clinical features that are comparable to the patients of HF, with the exception that diastolic dysfunction symptoms and increased left ventricular filling pressures may appear earlier than in other types of HF. In recent years, the investigation for epidemiologic risk factors of HF in the general

populace has continued. In Pakistan, very a little is known regarding the unique and specific risk factors of HHF. The majority of researches conducted in Pakistan were descriptive in nature. Even though cardiovascular events-associated risk factors 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 risk factors of HF in Pakistan. The RISK-HHF investigation is a case-control research study that aims to identify and characterise risk factors for hypertensive HF in Pakistan. A total of 100 individuals with HHF and a comparable number of sex- and age-matched hypertension controls without HF were included in the study. The specific objectives were to establish the strength of relativeness 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.

Material and Methods

This research was permitted by the research department, Pakistan Institute of Medical Sciences, Islamabad. All study participants provided informed written consent that was accepted by the research department. Participants were chosen from the medical wards and cardiology OPD of Medicine Department, Pakistan Institute of Medical Sciences, Islamabad. The enrolment of participants began on 1st-April-2020, and the study continued around 12 months, through May 20, 2021. Patients of age group 28 years or older, with a clinically diagnosed hypertension-induced Heart Failure and hospitalised for the very first time were registered as subjects in the research. Systemic hypertension patients without HF who had recently been referred to the cardiology clinic for therapy continuation throughout the research period were selected as controls using a simple random sample technique from the hospital's record. In a 1:1 ratio, the controls and cases were gender-matched and age-matched. Participants were curtained for their participation based on the study's usual set of selection criteria. In brief, the inclusion criteria for cases were clinically diagnosed patients of HF secondary to hypertension (mild HF to severe HF) and their hospitalisation or first visit to the cardiology clinic, 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. Cases and controls were excluded if they had HF due to another cause, had a previous myocardial infarction or ischemic cardiac disease history, had chronic obstructive pulmonary disease (COPD), were pregnant, or had smoked in the previous 5-10 years. An interview form was used to collect data, and responses were confirmed using clinical notes. The questionnaire was divided into three parts: A, B, and C. Part A was subdivided into subsections including demographic information (gender, age, BMI), lifestyle habits, and medical history. A food frequency questionnaire was used to evaluate the frequency of vegetables and fruit eating in a month, which was classified as daily, weekly, or monthly consumption. Salt intake was also measured in gram per day. The recommended amount of physical activity was well-defined as minimum 30 minutes of moderate-intensity exercise each day or minimum 150 minutes each week. Section B was centred on drug observance/adherence data. Medication adherence was evaluated and classified into three levels: high, medium, and low. Section C included electrocardiographic pattern encoding, where modified Minnesota coding scheme was used [7]. At every hospital visit, blood pressure (systolic & diastolic) was measured using mercury sphygmomanometer in accordance

with standard international recommendations. Patients were subjected to a cardiovascular assessment. Congested patients had any of the following symptoms: abdominal distension, pedal edoema, and orthopnoea, engorged neck veins, paroxysmal nocturnal dyspnoea, rales and basal lung crackles. A venous blood specimen (20ml) was drawn from all individuals, and serum creatinine and serum urea were determined. A urine specimen of 10 mL was collected for dipstick urinalysis. Proteinuria was considered as significant where trace proteinuria on dipstick were more than the standard. Data was collected via study proforma and analysis was done by using SPSS version 20.

Results:

A total of one hundred (100) age and sex coordinated case control pairs were engaged into this study. **Table: 1** shows basic demographic characteristics of study subjects. Mean age of participants was 38.4 years (case group) and 38.35 years (control group) with similar ratio of females and males. Subjects with hypertensive heart failure (case group) were more likely to be unmarried as compared to the control group participants. Hypertensive heart failure cases showed higher respiratory rates but lower blood pressures (systolic & diastolic) in comparison to controls. Statistically insignificant difference was seen between the both groups in terms of pulse rate. **Table: 2** shows that the obesity levels and hypertension in first degree relative were higher in the hypertensive heart failure than the control group. However, diabetes and kidney disease were higher in the subjects of control group. Individuals suffering from HHF were more inclined to have a history of renal disease. They were also much more inclined to consume a greater number of cigarette packs annually. Biochemical profile of both groups is also represented in **Table: 2**, significant amount of proteinuria by dipstick (42.3) was observed in cases while it had a low value (11.9) in controls. Individuals with hypertensive heart failure also had higher serum creatinine levels (1.1) and a significantly lesser estimated glomerular filtration rate (eGFR) than the controls. As shown by **Table: 3** medication adherences were considerably higher among the subjects of control group than the subjects of case group. The participants of control group were more likely to have been on antihypertensive medicines regularly than the individuals who developed hypertensive heart failure (cases). (**Table: 3**) Hypertension control group members were more inclined to eat vegetables and fruits on a daily basis as 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). **Fig: 1** shows the significant risk factors of hypertensive heart failure in multivariable model. History of anti-hypertensive drugs intake, daily intake of vegetables and fruits, and medication adherence represented the highest levels amongst the risk factors. Medication observance showed 67%, followed daily fruits and vegetables with 46%. Proteinuria was declared as 20%, while eGFR displayed negligible level of 5.3%.

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	0.9
BMI	26.1±3.09	25.9±2.9	0.01
SBP	121.5±7.16	129.75±11.64	0.01
DBP	81.9±7.64	90.4±10	0.072
Respiratory Rate	21.2±2.5	19.58±2.86	0.15

Marital Status Married Un-Married	 42.2 55.9	 53 47	0.01

Table 2: Medical history and biochemical profile of the participants n=200

Variables	Cases (n=100)	Controls (n=100)	P- Value
Medical History Diabetes Obesity Kidney Disease Hypertension in first degree relative	 21.6 14.6 25.5 36.3	 35.0 10.0 30.0 25.5	 0.05
Proteinuria	42.3±5.4	11.9±2.8	0.03
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 3: Lifestyle risk factors in the participants n=200

Variables		Cases (n=100)	Controls (n=100)	P- Value
Exercise	Not at all Below Recommendation Recommended Level	 32.4 47.1 18.6	 20 25 55	0.05
Smoking	Never Occasional Current Smoker	 15.7 44.1 38.2	 41 44 15	0.01
Medication dherence	High Medium Low	 22 28 50	 43 27 30	0.01
Salt Intake (gm/day)		4.7±1.2	4.73±1.2	0.01
Fruit & Vegetable Intake	Daily Weekly Monthly	 23 38 39	 50 35 15	0.05

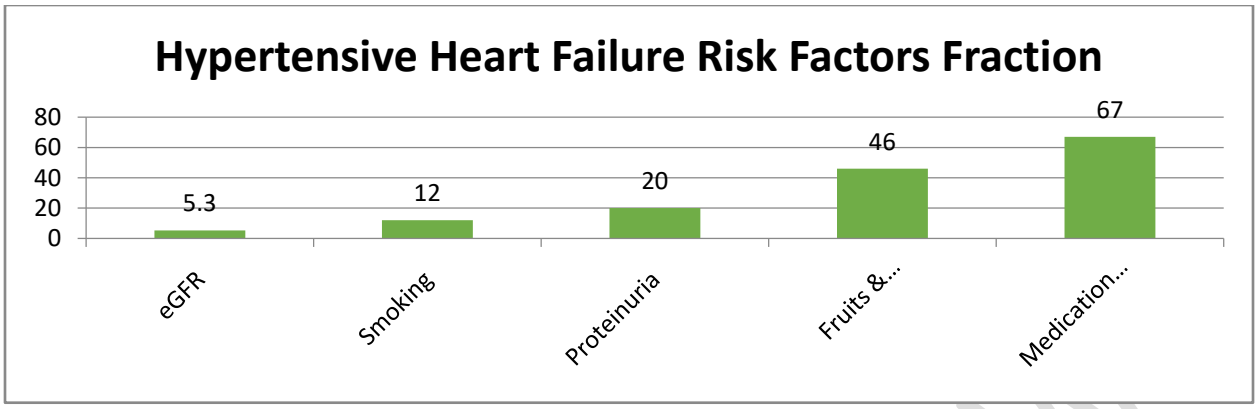

Figure 1: Bar graph exhibiting the fraction of heart failure risk factors among hypertensive individuals

DISCUSSION

In this study, Hypertensive Heart Failure (HHF) patients (study cases) were matched with hypertensive patients without Heart Failure (study controls) by sex and age range (. A comprehensive assessment of numerous lifestyle behaviours and metabolic risk factors was done. This is a unique research since only a few reserach studies in Pakistan have utilised this method to demonstrate the risk factors for HHF. In this study, mean age of study cases was 38.4±9.28 years and mean age of study controls was 38.35±9.04 years. This is in accordance with the findings by Almas A et al. [8] who have stated a higher mean age of 39.4±8.28 years and 39.65±6.04 among patients with hypertensive HF and controls respectively. There was exactly equal number of both sexes in both the groups. The patients were carefully chosen to reduce perplexing from age and sex. 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, smoking was not a significant risk factor of HF in our study. This might be attributable to the reality that Pakistanis have a lower smoking prevalence than other nations. 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 Jafary FH et. al [10], daily vegetable and fruits consumption decreased 30% relative risk in cases of acute myocardial infarction; the subjects who had low levels of serum beta-carotene showed 2.78-fold greater risk of HF according to antioxidant beneficial effects of carotenoids. In this investigation, salt intake and keeping salts on the dining tables were not linked with the risk of HHF. The individuals' salt intake was within the acceptable levels. Excessive salt consumption in the general population increases 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 behaviours in HHF. In this research study, less than 50% of individuals in each group exercised in some way. Sedentary lifestyles and inadequate 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 dyslipidaemia and obesity, which leads to cardiovascular deconditioning and insulin resistance [39, 40]. 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±5.4) as compared to the controls (11.9±2.8). Mueed A et al. [11] have also revealed that Even after controlling for other cardiovascular risk factors, proteinuria is a significant indicator of cardiac events in HF patients. The patients in this study's case group had lower mean systolic and diastolic (121.5±7.16 and 81.9±7.64 respectively) blood pressures, although having a greater respiratory rate (21.2±2.5), which is consistent with chronic sympathetic HF, which leads in poorer cardiovascular fitness in the long term. In this study, obesity was not related to the heart failure even though it was present significantly 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. [13]. The 'obesity paradox' has been attributed to thinness in HF patients.[14] In conclusion, the significant unfavourable 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. This research is not without limitations. This research features a carefully selected set of people, although great attempts have been taken to reduce misunderstanding. As a result, the discovery is solely applicable to hypertensive patients at risk of HF. Furthermore, the prevalence of ischemic cardiac disease in Pakistan remains low, and hypertension still accounts for the majority of heart failure episodes in our demographic.

CONCLUSION

In conclusion, this study analysed and determined the key risk factors for heart failure in hypertensive individuals. These risk factors include particular lifestyle and dietary habits, medication adherence, and renal function indicators. Health education should be expanded in

general and specialty care settings. Establishing a specific medication adherence clinic may help to identify individuals with poor medication adherence who may be at a greater risk of heart failure in a timely manner. All tertiary health institutes should build a comprehensive heart failure registry. This will help with future large-scale investigations and the validation of these findings. To summarise, a bigger case-control study, or possibly a cohort study, is necessary to corroborate the findings of this investigation on a greater scale.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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