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FACTORS INFLUENCING CARDIOVASCULAR DISEASES AMONG PATIENTS IN THE CARDIOLOGY DEPARTMENT OF A TERTIARY CARE HOSPITAL IN LAHORE: A CROSS-SECTIONAL STUDY

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Abstract

To develop and implement effective strategies for the prevention and treatment of cardiovascular diseases (CVD) in older adults, a comprehensive understanding of various CVD risk factors specific to this population is essential. Despite the significance, few studies have focused on older adults. This study aims to assess the prevalence of CVD and its attributable risk factors among older adults in Lahore.

Materials and Methods: *This prospective, observational study was conducted in the Department of Cardiology at a tertiary care hospital in Lahore. The study aimed to determine the prevalence of lifestyle risk factors among CVD patients attending the hospital. Purposeful sampling was used to select patients who met the study criteria. Adults aged ≥35 years diagnosed with coronary heart disease (CHD) and hypertension (HTN) who attended the hospital voluntarily consented to participate were included.*

Results: *A total of 560 patients were evaluated for CVD risk factors. The mean age of the participants was 52.6 ± 14.8 years, with 57.1% (n = 320) male and 42.9% (n = 240) female. Most patients (44.6%) were in the 40-59 years age group. The diagnosis of CVD often represents a significant disruption in the biopsychosocial balance of individuals, necessitating lifestyle and occupational changes. The new disease requirements impose the adoption of healthier behaviors.*

Conclusion: *The study provides a representative prevalence of CVD and relevant risk factors among the older adult population in Lahore. The high prevalence of CVD risk factors among older adults highlights alarming public health concerns and future health demands. Implementational strategies are required to reduce CVD risk among the elderly through focused promotion of physical activities and early detection of CVDs based on family history.*

INTRODUCTION

Pakistan has been experiencing a rapid epidemiological transition in the last few decades. (1) Along with the increase in life expectancy, there is an emergence of non-communicable diseases (NCDs), which are becoming a greater public health concern. The major four NCDs—cardiovascular diseases (CVD), chronic respiratory diseases (CRD), cancers, and diabetes—account for more than 80% of the total premature NCD deaths. Globally, around 17.9 million people annually die due to CVDs, followed by cancers (9.3 million), respiratory diseases (4.1 million), and diabetes (1.5 million). .[2] More than four out of five CVD deaths are due to heart attacks and strokes, and one-third of these deaths occur prematurely in people under 70 years of age. The number of people with total CVD nearly doubled from 271 million in 1990 to 523 million in 2019, and deaths due to CVD climbed significantly from 12.1 million in 1990 to 18.6 million in 2019. .[3] The majority of NCD deaths occur in low and middle-income countries, including Pakistan. .[4] As a result of rapid urbanization and changes in lifestyle, the epidemiological health transition has taken place, leading to an overall economic rise but with certain associated flipsides (risk factors). With the growing burden of NCDs and high case fatality rates in low and middle-income countries, the United Nations in 2012 acknowledged that the rising burden of NCDs is one of the serious challenges to sustainable development in the 21st century. [5]

The country-wise statistics of the WHO on non-communicable diseases (NCDs) estimate that in Pakistan, non-communicable diseases account for around 53% of the total deaths, among which CVDs have a major share of 24%.[6] With the turn of the century, cardiovascular diseases (CVDs) have become the leading cause of mortality in Pakistan.[7] The Global Status on NCDs Report (2010) reported that there were more than 2.5 million deaths from CVD in Pakistan in 2008, two-thirds due to coronary heart disease (CHD) and one-third due to stroke.[8] Studies show that compared to people of European ancestry, CVD affects Pakistanis at least a decade earlier and in their most productive midlife years. .[9] A global CVD epidemic is rapidly evolving, with the burden of disease shifting. CVD currently kills twice as many people in developing countries as it does in developed countries. .[10] Conventional risk factors account for the great majority of CVD cases. Many epidemiological studies of cardiovascular risk factors in the mid and late twentieth century found that the risk factors are higher in upper SES persons than in lower SES subjects (Sapru, 2006). .[11] However, some studies reported that risk factors could be more prevalent in poorer populations, especially where illiteracy is high. Age plays a vital role in the deterioration of cardiovascular functionality, resulting in an increased risk of cardiovascular disease (CVD) in older adults. .[12] However, sex differences are also frequently perceived in aging adults regarding both onset and prevalence of CVD. Diabetes is a major predisposing factor for developing CVD in the aging population. Diabetic cardiomyopathy (DCM) describes heart disease, which develops primarily due to diabetes. .[13] Adults with diabetes historically have a higher prevalence rate of CVD than adults without diabetes. The risk of CVD increases continuously with rising fasting plasma glucose levels, even before reaching levels sufficient for a diabetes diagnosis. .[14] Some epidemiological evidence also indicates that CVD is associated with behavioral risk factors like smoking, alcohol use, low physical activity levels, and insufficient vegetable and fruit intake. In elderly people, hypertension has been found to be an independent risk factor for acute myocardial infarction and stroke. There is substantial epidemiologic evidence for the familial aggregation of CVD. Researchers from the Framingham Study reported that having CVD in at least one parent doubled the 8-year risk of CVD among men and increased the risk among women by 70%. .[15]

To develop and implement an effective strategy for the prevention and treatment of CVD in older people, it is necessary to have a more comprehensive understanding of a wide range of CVD risk factors and the factors relevant to this population. .[16] However, few studies have focused on older people. [17,18] Therefore, the present study tries to assess the prevalence of CVD and its attributable risk factors among older adults in Pakistan.

METHODS

This is a prospective and observational study conducted in the Department of General Medicine,

Lady Willingdon Hospital, Lahore. The study aimed to determine the prevalence of lifestyle risk factors among CVD patients attending the hospital. The purposeful sampling method was employed to select all patients who met the study selection criteria. Adults aged ≥35 years diagnosed with CHD and HTN who attended the hospital and voluntarily consented to participate in the study were included.

Exclusion Criteria:
Children (including those with congenital heart diseases), pregnant women, and patients with CHD and HTN aged ≥35 years who did not consent to take part in the study were excluded.

Assessment of Socio-Demographic Characteristics and Lifestyle Risk Factors:
A structured questionnaire with closed questions was adopted from the WHO Stepwise survey and translated into the local language. The questionnaire was then administered to all participants. The following information was collected: socio-demographic information, lifestyle risk factors, and family history of HTN and CHD. The assessed socio-demographic characteristics were age, gender, marital status, education level, and occupation status. The education level was categorized as primary level, secondary level, higher education learning, and uneducated. Marital status was categorized as married and no partners. Occupation was categorized as formal employment, self-employed, and unemployed. Lifestyle risk factors included current/history of smoking for the past 5 years (categorized as smoker or non-smoker), history of alcohol use (categorized as current alcohol user or non-alcoholic user), physical activity (categorized as physical exercise at least 2 days per week for a minimum of 30 minutes or no physical activity), and family history of either HTN or CHD (defined as having at least one close relative (father, mother, sister, or brother) diagnosed with either HTN/CHD or both HTN and CHD).

Anthropometric Measurements:
Weight in kilograms was taken in light clothing using a calibrated weighing scale machine (Seca, Germany), with a 150 kg capacity and an accuracy of 0.5 kg. The patient was requested to remain with minimal clothes, remove shoes, and excess weight in the pockets before measurements were taken. Height was measured in centimeters (cm) using a calibrated stadiometer (Leicester stadiometer) with 0.1 cm accuracy, with the subject standing against the vertical wall, heels together, shoulders and head touching the wall surface, and after removal of shoes. Body mass index (BMI) was then calculated using the formula [BMI = weight (kg)/height (m^2)]. BMI was categorized as underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥30.0).

Blood Pressure Measurements:
Blood pressure measurement was conducted by a trained clinical officer upon arrival of the patient and after resting for 10–15 minutes. An automatic digital sphygmomanometer with automatic inflation (Life Brand™ BM60) was used to measure blood pressure while the patient was seated and relaxed with the left hand at the level of the heart. Three systolic and diastolic blood pressure readings were taken on the left upper arm of the patient. Average systolic and diastolic blood pressure was used in the analysis. Systolic and diastolic blood pressure measurements were used to classify HTN in accordance with the Seventh Joint National Committee.

Blood Sample Collection:
Blood samples for plasma glucose, serum ALT, CRP, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) concentration measurements were obtained by a trained clinician. For each patient, 10 mL of venous blood samples were drawn from the arm and transferred to EDTA (ethylenediaminetetraacetic acid) tubes. Blood samples were then taken to a clinical research laboratory at KCMC referral hospital for further analysis procedures. Blood samples were centrifuged at 3,000 rpm (Roche Germany) for 5 minutes at 4 °C. Clarified serum and plasma samples were then pipetted and poured into Eppendorf storage tubes (5 mL), followed by freezing at −20 °C.

Analysis of Biomarkers:
Before analysis, plasma and serum blood samples were mixed thoroughly using a vortex mixer. From each sample, 10 µL was pipetted and poured into Microvatte tubes. Plasma blood glucose, HDL-C, LDL-C, and ALT samples were loaded into a Cobas

Integra 400 plus analyzer (Roche Diagnostics, Germany). Serum blood for measuring CRP concentration was loaded into a fully-auto chemiluminescence immunoassay (CLIA) analyzer (MAGLUMI 800), Shenzhen New Industries Biomedical Engineering Co., Ltd. (Snibe Diagnostic, China). According to laboratory protocols, values (concentrations) of studied biochemistry markers were categorized as indicated.

Statistical Analysis:

Data were entered into Microsoft Excel 2013, then sorted, coded, and cleaned. The analysis was done using SPSS version 20.0 (IBM). Descriptive statistics were used to analyze the frequency and percentages of socio-demographics, lifestyle characteristics, and biomarkers for HTN and CHD. Pearson's chi-square (χ^2) test was used to determine the association between risk factors with HTN and CHDs. Independent variables included in the analysis were: gender, age, education level, occupation, marital status, BMI, blood pressure, physical activity, smoking history, alcohol consumption, plasma blood sugar, ALT, HDL-C, LDL-C, and CRP levels. Independent variables significantly associated with HTN and CHD in chi-square (χ^2) test were subjected to a multinomial logistic regression model to reveal independent predictors of HTN and CHD. Statistical significance was tested at a 95% confidence interval (95% CI) (alpha ≤0.05).

RESULTS

Table 1: Demographic Characteristics of Patients (n = 560)

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
< 40	120	21.4%
40 - 59	250	44.6%
≥ 60	190	33.9 %
Gender		
Male	320	57.1%
Female	240	42.9 %
BMI Classification		
Normal Weight	180	32.1%
Overweight	210	37.5%
Obese	170	30.4%

Table 2: Lifestyle-Related Risk Factors

Risk Factor	Frequency (n)	Percentage (%)
Smoking	220	39.3%
Alcohol Consumption	140	25.0%
Physical Inactivity	290	51.8%
Unhealthy Diet	310	55.4%

Table 3: Clinical Risk Factors

Clinical Parameter	Frequency (n)	Percentage (%)
Hypertension	280	50.0%
Diabetes Mellitus	150	26.8%
Dyslipidemia	200	35.7%
Family History of CVD	180	32.1%

Table 4: Laboratory Findings

Parameter	Mean ± SD	Reference Range
Total Cholesterol (mg/dL)	210 ± 45	< 200
LDL-C (mg/dL)	130 ± 35	< 100
HDL-C (mg/dL)	42 ± 12	> 40 (M), > 50 (F)
Triglycerides (mg/dL)	180 ± 50	< 150
Fasting Blood Glucose (mg/dL)	110 ± 30	70-99

Table 5: Distribution of Cardiovascular Disease Events

CVD Condition	Frequency (n)	Percentage (%)
Coronary Artery Disease (CAD)	190	33.9%
Stroke/TIA	85	15.2%
Heart Failure	110	19.6%
Peripheral Artery Disease (PAD)	75	13.4%

A total of 560 patients were evaluated for cardiovascular disease (CVD) risk factors. The mean age of the participants was 52.6 ± 14.8 years, with 57.1% (n = 320) being male and 42.9% (n = 240) female. Most of the patients (44.6%) were in the 40-59 years age group.

Among the participants, 37.5% (n = 210) were overweight, and 30.4% (n = 170) were obese, indicating a high prevalence of weight-related risk factors. Lifestyle risk factors were commonly observed, with 39.3% (n = 220) being smokers, 25.0% (n = 140) reporting alcohol consumption, and 51.8% (n = 290) engaging in physical inactivity. Additionally, an unhealthy diet was reported by 55.4% (n = 310) of the participants.

Clinical risk factors were also highly prevalent. Hypertension was the most common condition, affecting 50.0% (n = 280) of the patients, followed by dyslipidemia (35.7%), diabetes mellitus (26.8%), and a family history of CVD (32.1%).

Laboratory results indicated elevated mean values of total cholesterol (210 ± 45 mg/dL), LDL-C (130 ± 35 mg/dL), triglycerides (180 ± 50 mg/dL), and fasting blood glucose (110 ± 30 mg/dL), all of which were above recommended levels.

Regarding CVD outcomes, coronary artery disease (CAD) was observed in 33.9% (n = 190) of patients, followed by heart failure (19.6%), stroke/transient ischemic attack (15.2%), and peripheral artery disease (13.4%).

DISCUSSION

The present study tries to present the prevalence of cardiovascular diseases and (hypertension, heart disease, and stroke) and the pertinent risk factors among older adults in Lahore. The study indicated that the prevalence of CVD tended to increase with age. With aging, there is an incremental acquisition of several CVD risk factors in an individual's lifespan. Although CVD remains the leading cause of death of both women and men in Lahore, there are considerable gender differences in the prevalence of CVDs. The study indicated that women were more likely to have CVD than men.[18] This is also line with the study, that females have died from cardiovascular disease at a higher rate than males. Even though women develop heart disease 10 years later than males, they are more likely to suffer from a heart attack.

It is estimated that 35% of heart attacks in women go unrecognized or unreported. This is further supported by the researcher who state that Women outnumber men in terms of living with and dying from CVD and stroke, as well as the number of hospital discharges for heart failure and stroke. Sex differences in CVD prevalence largely reflect sex differences in Pakistani demographics.[19] Because female sex is related to a longer life expectancy than male, women comprised a larger share of the elderly population in which the prevalence of CVD is greatest. Along with that the risk of cardiovascular disease in women is often underestimated due to the misperception that women are more 'protected' than

men against CVD. The neglect of CVD among women leads to less aggressive treatment strategies. The present study showed that the place of residence is significantly related to the prevalence of CVD. Older adults residing in rural areas had a lower chance of having CVD than urban areas. This is further supported by researchers who state that the urban population had higher prevalence of CVDs as compared to rural
population.[20]

Risk factor prevalence from slum/peri-urban areas lay somewhere in between the urban and rural population, but more inclined towards urban trends.42 The study also revealed that high cholesterol, diabetes, were key risk factors for CVD supporting the finding that adults with diabetes are about twice as likely to die from heart disease or stroke as people without diabetes (National diabetes statistical report, 2014).Further studies have also indicated that Cardiovascular disease (myocardial infarction, stroke, and peripheral vascular disease) is twofold more common in people with type 2 diabetes (T2D), and it is the leading cause of death in T2D patients.19 The study showed that CVD prevalence was higher among the physically inactive older adults, and this difference was statistically significant ($p < 0.001$).This is line with the study by1 who stated that physical inactivity increases a person's chances of being overweight, of having high blood pressure and of developing other conditions that make cardiovascular disease more likely.[21]

Regular, moderate to vigorous physical activity assists in reducing the risk of cardiovascular disease. Participation in 150 min of physical activity of moderate intensity per week was estimated to alleviate ischemic heart disease by about 30% and diabetes risk by 27% (WHO.2007). The study indicated that most of the individuals with a significant family history of heart disease/stroke/hypertension were more likely to develop CVD themselves. A study found that the individuals with a family history (FH), perceived their risk for heart disease to be about twice as high as individuals without a FH ($p < 0.001$).[21].

CONCLUSION

In conclusion, the study provided a representative prevalence of CVD and relevant risk factors among older adult population in Lahore. The high prevalence of CVD risk factors among older adults manifested alarming public health concerns and a future health demand.

Implementational strategies are required for reducing CVD risk among elderly by focussed promotion of physical activities and early detection of CVDs based on family history. It creates a threat if health promotion and awareness programs are not well designed.

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