



A Study of Risk Factors of Coronary Heart Disease in Population of Malwa Region of Punjab

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ABSTRACT Coronary Heart Disease occurs when the blood supply to the heart is blocked or interrupted by a build-up of fatty substances in coronary arteries. After a certain time period, the walls of the arteries become piled up with fatty deposits, which makes the arteries narrow from inside and interrupt the flow of blood. The present study was conducted to ascertain the prevalence of risk factors in Coronary Heart Disease patients of Malwa region of Punjab. In the present study, the prevalence of smoking (in males) was 30.2 percent, alcohol intake (in males) was 41.5 percent, and additional risk factor such as obesity was 70.8 percent in males and 55.3 percent in females. Coronary risk factors were higher among the males as compared to the females. Smoking and alcohol intake could be the reason causing a higher risk for developing coronary heart disease among males.

INTRODUCTION

The heart is a muscle mass about the size of the fist. It pumps blood around the body and beats approximately 70 times a minute. The heart gets its own supply of blood from a network of blood vessels on its surface called coronary arteries. Coronary Heart Disease occurs due to narrowing of the coronary arteries, which, provide oxygenated blood to the heart muscles. The reduction in the diameter of arteries is the result of a steady accumulation of fatty deposits on their inner walls. This condition is called atherosclerosis. With the passage of time, the arteries become so narrow that they cannot deliver enough oxygen-rich blood to the heart. This may result in angina, a condition causing chest pain and discomfort to the patient. It may feel like squeezing in the chest, pain in the shoulders, arms, neck, jaw or back. At some point, the fatty substances deposited on arterial walls may burst and obstruct the coronary artery and cut off the supply of oxygen-rich blood to the heart. This may damage the heart muscles permanently which is known as heart attack. At this time, quick treatment is required, otherwise, there are chances of serious health problems.

There are many risk factors that increase the likelihood of developing coronary heart disease. These factors include smoking, drinking alcohol, high blood pressure, high blood cholesterol, diabetes, physical inactivity, overweight or obesity, family history of heart disease, advancing age, etc. The individuals with these risk factors have double chances to have heart disease as compared to those who have none.

Cardiovascular diseases are the largest cause of mortality in the world, and the majority of the deaths occur in low- and middle-income countries such as India and China (WHO 2010). A total of 17.7 million deaths were caused by cardiovascular diseases and India has a major contribution to these numbers. Out of these 6.2 million deaths occur in 30-69 age group (WHO 2016). In the US, the prevalence of heart diseases was 2.5 percent. In India, the prevalence of diabetic and non-diabetic patients with coronary heart disease was 21.4 percent and 11 percent respectively. The health status in different countries showed that Asian-Indians were at three times higher risk of heart diseases in the US than the national average. Cardiovascular diseases mortality rate (age-adjusted) was 349/100,000 in males and 265/100,000 in females in India, which was 2-3 times higher than US rates that are 170/100,000 in males and 108/100,000 in females. In the UK, the prevalence of heart diseases among Asian-Indians were noticed to be 2-3 times higher than their national average. In general, heart complications among Asian-Indians were reported to be 2-4 times higher than other ethnic groups

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and 5-10 times higher for the population aged less than 40 years. Coronary heart disease was stated as a major cause of illness and death in India (Ardeshna et al. 2018; Gupta et al. 2016; WHO 2014; Mohan et al. 2001; Enas et al. 1996; Enas and Mehta 1995; Balarajan 1991). More than 2.1 million deaths in India were caused by cardiovascular disease at all ages. It was noticed that Punjab, Andhra Pradesh, and Tamil Nadu were the major contributory states (Ke et al. 2018).

Cardiovascular diseases, especially coronary heart disease is the leading cause of death in India (Gupta and Gupta 2009). Of the estimated 58 million deaths globally from all causes in 2005, cardiovascular diseases accounted for 30 percent of deaths. In India, cardiovascular diseases accounted for 31.7 percent of the deaths in India (Bajaj et al. 2012). A total of 17.5 million deaths due to cardiovascular diseases were estimated in 2012, which represented 31 percent of global deaths. Out of these deaths, it was estimated that 7.4 million deaths were due to coronary heart diseases and stroke was the reason behind 6.7 million deaths. It was also observed that people aged between 35 years and 65 years were more prone to coronary heart disease (Zholdybayeva et al. 2016). The comparison of the rural-urban population of India showed that prevalence of heart diseases increased two-fold in rural areas and nine-fold in the urban areas. The incidence of coronary heart disease in the rural population was 1.6 – 7.4 percent whereas it was 1 – 13.2 percent among the urban population of India. (Gupta and Gupta 2009; Chauhan and Aeri 2015). According to National Family Health Surveys (NFHS 2005-2006), smoking is increasing among young people (20-35 years). The production and intake of tobacco has increased significantly in India. In urban populations, smoking is increasing among low educational status subjects (Gupta et al. 2003). The prevalence of hypertension has increased in both urban and rural subjects and presently it is 25 - 40 percent in urban adults and 10 -15 percent among rural adults and its prevalence is projected to rise from 118 million in the year 2010 to 214 million in 2025 in India (Gupta 2005). Huffman and Prabhakaran (2010) have reported an estimated increase in coronary heart disease occurrence due to obesity in India (0.3% in women and 0.5% in men) which was because of the sed-

entary lifestyle and psychosocial stresses in the country.

The prevalence of coronary heart disease and its risk factors were studied by Sarvotham et al. (1968), Wander et al. (1994), Gupta and Gupta (2009), Huffman and Prabhakaran (2010), Kar et al. (2010), Bajaj et al. (2012), Krishnan (2012), De et al. (2013), Shokeen and Aeri (2015), Gutierrez et al. (2018), India State-Level Disease Burden Initiative CVD Collaborators (2018) and Pencina et al. (2019). All the studies found a positive correlation between risk factors and coronary heart disease. The frequency of heart diseases was reported in different populations by Sharma and Ganguly (2005), Singh et al. (2005), Pandey et al. (2012), Hiremath et al. (2018) and Ke et al. (2018). Sharma and Ganguly (2005) and Shokeen and Aeri (2015) concluded that coronary diseases were more prevalent in younger age groups as compared to older ones. By considering all the above data, incidence rates and interference of different risk factors for disease development, the study was designed to predict the prevalence of several risk factors in Punjab state.

Objectives

The present study was conducted to determine the prevalence of risk factors in Coronary Heart Disease patients in the Malwa region of Punjab.

MATERIAL AND METHODS

In this study, 200 subjects, aged 40-70 years were randomly selected, who belonged to different districts of Malwa region of Punjab state. The data were collected from June 2015 to January 2018. All the subjects were confirmed coronary heart disease patients. The study was approved by the Institutional Ethics Committee (IEC) of the Punjabi University, Patiala. The BMI (Body Mass Index) has been calculated for all the subjects to measure obesity in this particular population. For calculating BMI, height has been measured by using an anthropometric rod and weight by weighing machine. In addition, blood pressure has been measured by sphygmomanometer for all the subjects included in the study to find out the prevalence of hypertension as a risk factor. In addition, factors such

as smoking and alcohol intake by patients were also considered. The classification for obesity and blood pressure was done by criteria given by WHO (2000) and JNC7 (2003) respectively.

RESULTS

In the present study, 53 percent of males and 47 percent of females were recruited (Table 1). The mean age of male and female patients was 58.4 and 58.04 years respectively. The incidence of smoking and alcohol consumption was a risk factor in 30.2 percent and 41.5 percent male subjects respectively. Whereas the females were not having these risk factors as they never smoked or consume alcohol. The systolic and diastolic blood pressure of females with coronary heart disease was 123.9±22.6 (mmHg) and 82.3±11.4 (mmHg), respectively. In males with coronary heart disease, the systolic and diastolic blood pressure was 123.8±19.2 (mmHg) and 82.5±12.4 (mmHg), respectively. There was statistically non-significant difference between the sexes in systolic and diastolic blood pressure, however, the systolic blood pressure was more dispersed in females.

All the subjects were classified according to BMI classification given by WHO (2000). In the

case of males suffering from Coronary Heart Disease, 9.4 percent, 19.8 percent, and 70.8 percent were found to be normal, overweight and obese, respectively and none of the male patients were found to be underweight. In the case of coronary heart disease female patients, 3.2 percent were underweight, 21.3 percent were normal, 20.2 percent were overweight and 55.3 percent were obese. The values indicated that more female patients were undernourished than male patients. On the other hand, obesity was more prevalent in male patients, which might cause coronary heart disease in males. The differences between the BMI of male and female patients were statistically significant (Table 2).

The blood pressure of all coronary heart disease patients was measured and the subjects were divided according to criteria for systolic and diastolic blood pressure (Table 3), as given by JNC7 (2003). It was observed that 29.2 percent of males and 35.1 percent of females were having a normal range of systolic blood pressure. On the other hand, in 31.1 percent of males and 25.5 percent of females, the normal range of diastolic blood pressure was observed. It was further found that 49.1 percent (for SBP) and 34 percent (for DBP) males were in the prehypertension stage of systolic and diastolic blood pressure, respectively. On the other hand, females were 38.3 percent (for SBP) and 31.9 percent (for DBP) in the prehypertension stage of systolic and diastolic blood pressure, respectively. Thus males were more susceptible to be hypertensive as compared to females. In the present study, 21.7 percent (for SBP) and 34.9 percent (for DBP) of males and 26.6 percent (for SBP) and 42.6 percent (for DBP) of females, respectively, were hypertensive according to their systolic and diastolic blood pressure. The results indicated that hypertension is a risk factor

Table 1: Different variables in patients with Coronary Heart Disease (CHD)

Variables	Males (n=104)	Females (n=96)
Mean age (years)	58.4±8.72	58.04±8.53
Gender	53%	47%
Smoking	32(30.2%)	0
Alcohol consumption	44(41.5%)	0
SBP (mmHg)	123.83±19.2	123.95±22.6
DBP (mmHg)	82.5±12.4	82.3±11.4

n = no. of subjects

Table 2: Prevalence of obesity in males and females suffering from Coronary Heart Disease (CHD)

BMI classification (WHO 2000)	Grades	Males	Females	Chi-square (p-value)
<18.5	Underweight	0	3 (3.2%)	$\chi^2= 9.91$ Df= 3
18.5 – 22.9	Normal	10 (9.4%)	20 (21.3%)	
23.0 – 24.9	Overweight	21 (19.8%)	19 (20.2%)	p-value= 0.02
>25	Obese	75 (70.8%)	52 (55.3%)	

BMI= Body Mass Index; WHO= World Health Organization, 2000; Chi-square used to calculate p-value; p-value less than 0.05 considered statistically significant.

Table 3: Prevalence of hypertension in patients suffering from Coronary Heart Disease (CHD)

Blood Pressure (mmHg)	Cut off values (JNC7, 2003)	Grades	Males	Females	Chi-square (p-value)
Systolic	<120	Normal	31(29.2%)	33 (35.1%)	$\chi^2= 2.34$ Df= 2 p-value= 0.31
	120-139	Pre-hypertension	52(49.1%)	36 (38.3%)	
	>140	Hypertension	23(21.7%)	25 (26.6%)	
Diastolic	<80	Normal	33(31.1%)	24 (25.5%)	$\chi^2= 1.37$ Df= 2 p-value= 0.5
	80-89	Pre-hypertension	36 (34%)	30 (31.9%)	
	>90	Hypertension	37(34.9%)	40 (42.6%)	

JNC7= Seventh Report of Joint National Committee (JNC) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, 2003; Chi-square used to calculate p-values; p-value less than 0.05 considered as statistically significant.

for developing coronary heart disease more in females as compared to males.

DISCUSSION

In the case of males of the present study, smoking (30.2%) was found to be a risk factor for coronary heart disease. Results of the present study are in line with those of the earlier studies which have shown the prevalence of smokers in male coronary heart disease patients as 36 percent in northern India (Prabhakaran et al. 2005), 16 percent in Punjab (Singh et al. 2005), 42 percent in Kerala (Thankappan et al. 2010), 40.1 percent in West Bengal (De et al. 2013), 38 percent in Chennai (Gajalakshmi et al. 2018), 52.9 percent in Vietnam (Hein et al. 2018), 15.1 percent in Indian population (India State-Level Disease Burden Initiative CVD Collaborators 2018), 97.9 percent in India (Corsi and Subramanian 2019) and 14.8 percent in US (Pencina et al. 2019). Indian Council of Medical Research Noncommunicable Disease Risk Factor Surveillance Study (2009) concluded that the prevalence of smokers among coronary heart disease patients was 27.3 percent in Kerala, 27.4 percent in Tamil Nadu, 41.2 percent in Madhya Pradesh. None of the recruited females in the present study were smokers and therefore smoking is not a risk factor for coronary heart disease in females. But in several studies, female smokers were found as 0.2 percent in Kerala and 0.9 percent in Madhya Pradesh (Indian Council of Medical Research Noncommunicable Disease Risk Factor Surveillance Study, 2009), 1.7 percent in all over Indian population (India State-Level Disease Burden Initiative CVD Collaborators 2018), 17.5 percent from

(central) Vietnam (Hien et al. 2018) and 2.1 percent in data from the fourth Indian National Health Survey (Corsi and Subramanian 2019).

As none of the female patients were found to be alcoholic in the present study, so, alcohol intake (41.5%) was found as a risk factor in males only. History of alcohol intake in male coronary heart disease patients among different studies was 10 percent in Punjab (Singh et al. 2005), 54 percent in Chandigarh and Haryana (Kar et al. 2010), 12.5 percent in rural population of north-eastern Rajasthan (Pandey et al. 2012), 22.52 percent in West Bengal (De et al. 2013), 28 percent in Chennai (Gajalakshmi et al. 2018), 16.2 percent in Vietnam (Hien et al. 2018) and 95.8 percent in data from the fourth Indian National Family Health Survey (Corsi and Subramanian 2019).

The prevalence of hypertension was more in female coronary heart disease patients than their male counterparts. In the case of systolic blood pressure measurements, more females were found to be hypertensive (26.6%) in comparison to males (21.7%) while prehypertension was greater in males (49.1%) than in females (38.3%). On the other hand, in the case of diastolic blood pressure measurements, hypertension was again higher in female coronary heart disease patients (42.6%) as compared to male patients (34.9%). Similar results (46.1% females and 43.8% males) have been found in northern India in a study done by Sarvotham et al. (1968). Indian Council of Medical Research Noncommunicable Disease Risk Factor Surveillance Study (2009) reported the prevalence of hypertension among Madhya Pradesh, Kerala, and Tamil Nadu as 21.1 percent, 18 percent, and 17.7

percent respectively. Other studies showed hypertension to be in 36.4 percent of males and 37.5 percent of females from Jaipur (Gupta et al. 2002), 30 percent in population of Delhi (Prabhakaran et al. 2005), 37 percent of males and 34 percent of females from northern India (Kar et al. 2010), 28.8 percent of subjects from Kerala (Thankappan et al. 2010), 28.6 percent from Jhalawar (Rajasthan) (Pandey et al. 2012), and 43.97 percent of subjects from West Bengal (De et al. 2013). High systolic blood pressure was observed in 20.9 percent males and 21.2 percent females in Indian population (India State-Level Disease Burden Initiative CVD Collaborators 2018), 82.9 percent males and 17.1 percent females from Saudi Arabia (Gutierrez et al. 2018), 25.3 percent of patients from the Prospective Observational Longitudinal Registry of patients with stable coronary artery disease (CLARIFY) registry (Hiremath et al. 2018).

On the basis of BMI, both male and female coronary heart disease patients were obese in the present study, but obesity was more prevalent in males (70.8%) as compared to females (55.3%). According to Indian Council of Medical Research Noncommunicable Disease Risk Factor Surveillance Study (2009), 19.4 percent, 8.2 percent, 27.1 percent, and 22.6 percent population were obese from Andhra Pradesh, Madhya Pradesh, Kerala, and Tamil Nadu, respectively. Gupta et al. (2002) reported obesity to be 24.5 percent in males and 30.2 percent in females, as well as overweight in 21.9 percent males and 23.1 percent females from Jaipur. Hiremath et al. (2018) observed 78.2 percent overweight and 26.7 percent obese patients from the Prospective Observational Longitudinal Registry of patients with stable coronary artery disease (CLARIFY) registry. Hien et al. (2018) reported overweight and obesity in 32.5 percent males and 39.7 percent of females from Vietnam. Other studies on heart patients found 35 percent of patients from northern India (Prabhakaran et al. 2005), 15 percent males and 22 percent females from northern India (Kar et al. 2010) and 11 percent patients (WHO 2011) to be overweight. On the other hand, only 3.2 percent females and none of the male patients were found to be underweight in the present study while 16 percent males and 10.3 percent females were observed as underweight in (Central) Vietnam (Hien et al. 2018).

CONCLUSION

In the present study, only coronary heart disease patients were included. It can be concluded that in males, obesity could be the risk factor for developing coronary heart disease and in females, hypertension is the reason for the disease. Further, the females recruited in the study were neither smokers nor alcoholics, so both these factors were prevalent in their male counterparts only.

RECOMMENDATIONS

As a result of the present study, it can be put forward that it is essential to encourage healthy living and precautionary programs in India. An awareness of the schemes should comprise of a healthy diet and increased physical activity. Alcohol consumption and tobacco smoking should be avoided. Accurate screening of other risk factors (hypertension, diabetes, hypercholesterolemia, etc.) should be monitored regularly.

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