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A Pilot Study on Recognition and Prevalence of Risk Factors for Cardiovascular Diseases in North Indian Populace of Jammu and Kashmir

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ABSTRACT The aim of the present study was to recognize and to know the prevalence of different risk factors for CVDs in the North Indian people of J&K state. A total of 460 study participants (220 CVD patients and 240 controls) were enrolled for the study. A detailed health questionnaire covering socio-demographic, anthropometric, biochemical and lifestyle parameters were designed for the study. The results so obtained concluded that body mass index (BMI) and waist-hip ratio (WHR) was significantly higher in patients (p=0.002 and p<0.0001 respectively). A significant difference was observed in metabolic parameters: Total cholesterol (TC) (p=0.00001), triglycerides (TG) (p=0.00003), low density lipoprotein (LDL) (p=0.053), high density lipoprotein (HDL) (p=0.001), urea (p=0.00002) and creatinine (p=0.002) among patients and controls. Presence of hypertension (HTN) (55%) was higher as compared to diabetes mellitus (15.91%) as co-morbidity in patients. Family history (8-folds risk), alcoholism (6-folds risk) and smoking (3-folds risk) were the three most prevalent risk factors which were adding maximum risk towards CVD outcome. A proper healthy and unstressed lifestyle could be the best management option for CVDs.

INTRODUCTION

Cardiovascular diseases (CVDs) refer to a class of diseases that involve the heart and/or blood vessels. CVDs have become the single leading cause of death and disease burden globally in countries like India (Eidgahi et al. 2018). The high prevalence of CVD risk factors in Indian populace is the ultimate upshot of urbanization and changing lifestyles. People are characterizing urbanization not only by industrial, social and economic uplift but by a significant increase in the intake of high caloric foodstuffs, living a sedentary and stressful life and grabbing health-damaging behavior like smoking or alcohol intake as a trend mark. All these circumstances finally, promote the development of hypertension (HTN), dysglycaemia and dyslipidemia. In fact, the present scenario is that twenty percent of Indians suffer from HTN (Joshi and Parikh 2007) and it looks like HTN is becoming the "Fashion disease" affecting every second individual in the society. It is also documented that India would experience a peak increase in cardiovascular ailments with a burden of more than fifty percent of the cardiac patients worldwide within the next 15 years (Gupta et al. 2008). Research efforts in the recent decades have highlighted that CVD is a multifactorial disease and identified several predisposing risk factors like smoking, increased BMI, abnormal lipid profile, HTN, physical inactivity, positive family history and diabetes mellitus (Tanuseputro et al. 2003; Gupta et al. 2015; Raina et al. 2016; Benjamin et al. 2018). The biochemical picture of CVD depicts that vascular atherosclerotic events are directly linked with profoundly increased levels of serum triglycerides (TGs) and low-density lipoprotein (LDL) and have an inverse association with high-density lipoprotein (HDL). Smoking, sedentary lifestyle and unhealthy diet viz. non-vegetarian food, high caloric eatables and lack of dietary fibres further complicate the disease prognosis. Estimates from disparate cross-sectional studies from different states of India indicated the high prevalence and association of different risk factors with CVD. However, there is the paucity of data on the prevalence and risk factors associated with CVD phenotypes in the inhabitants of Jammu and Kashmir (J&K).

Mukherjee and Koul (2014) have estimated the economic burden of coronary heart disease in Jammu and they clearly mentioned that households in Jammu tolerate a significant out-of-pocket expenditure involving sixty-five percent for medications, twenty-two percent for dietary modifications and thirty percent of catastrophic expenses. To curtail the financial burden of CVD to some extent in J&K, the only option is lifestyle modifications. It is therefore imperative to study different risk factors associated with cardiovascular problems in J&K state.

Objective

In view of above said and with this perspective, the present study was a pilot study approach to generate a preliminary data on prevalence and association of different CVD risk factors in the North Indian population of Jammu and Kashmir (J&K).

MATERIAL AND METHODS

Study Participants

The present case-control study was conducted on 460 individuals (220 cases and 240 controls) belonging to J&K ethnicity. The subjects were recruited from Acharya Shri Chander College of Medical Sciences and Hospital (ASCOMS) and University premises during the period of 6 months (July-December 2017). Eligible cases were patients with diverse CVD phenotypes encompassing coronary artery disease, myocardial infarction, stroke, cardiomyopathy, rheumatic heart disease, arrhythmia, congenital heart disease, heart block, and hypertension. Nevertheless, HTN itself is counted in CVD category but it is also remarked as one of the important risk factors for other cardiovascular diseases. In the present study, the researchers have taken HTN as a risk factor in those cases where HTN and other cardiovascular diseases co-exist. Cases with a history of prolonged raised blood pressure (BP) only without any other cardiovascular complication were taken in the category of essential hypertension (EH). The study protocol was approved by Animal and Human Experimentation Ethical Committee (AHEEC), University of Jammu (JU) and a prior informed written consent was duly signed from each study participant/ attendant (for incompetent participants) before data and blood collection.

Data Collection

A detailed pre-designed health questionnaire, including parameters such as age, dwelling, marital status, religion, educational status, history of CVD, habit of smoking/tobacco and alcohol intake along with duration of consumption (in years), dietary pattern, psychological behaviour and family history along with anthropometric and physiometric variables was duly filled from each individual. BMI was calculated as the ratio of weight and height (weight in kg and height in meters) and the values were defined according to the recommendations proposed by WHO for Asians (WHO Expert Consultation 2004). WHR was obtained as waist circumference divided by hip circumference. Pulse rate (PR) was counted by feeling radial artery at the wrist over one minute. Pulse pressure (PP) was calculated by applying the formula:

PP= Systolic blood pressure (SBP) - Diastolic blood pressure (DBP)

Psychological factors like stress/tension, headache and anger were taken purely on an interview basis and on clinical records of personality disorder from study participants. Stress trait included financial based, family-based, professional based, social isolation, depressive mood, and disease-induced stress. Basal metabolic rate (BMR) was calculated as Kcal/day using the Harris-Benedict equation.

Biochemical Profiling

Blood samples were taken from each study participant for biochemical profiling by an automated biochemical analyzer (Roche, Cobas CIII). Subjects were diagnosed with diabetes mellitus in accordance to American Diabetes Association criteria that is, fasting blood glucose>126mg/dl and/or 2- hour postprandial blood glucose following a >200mg/dl or history of diabetic medication (ADA 2004). The diagnostic criteria for dyslipidemia includes abnormal lipid levels with serum triglyceride level >150mg/dl, high total cholesterol level > 200mg/dl, high LDL cholesterol level >130mg/dl or Low HDL cholesterol level >40mg/dl and patients on lipid-lowering drugs at the time of the study (NCEP 2001). According to JNC 7 guidelines patient on antihypertensive medications or having a systolic blood pressure (SBP) of 140mmHg or greater and a diastolic blood pressure (DBP) of 90mmHg or

greater were considered as having hypertension (Chobanian et al. 2003). Other biochemical measurements like blood urea, uric acid and creatinine were also taken.

Statistical Methods

The mean and standard deviation was calculated and student's t-test was performed to calculate the difference between the patients and controls using SPSS software 20.0 version. The researchers also estimated the univariate risk provided by different risk factors for CVD [as odds ratio (OR)]. All the tests were considered statistically significant at $p<0.05$.

RESULTS

The present study included a list of various risk factors which were grouped into following c ategories along with the data observed:

Socio-demographic Characteristics of the Study Participants

In the present study the majority of study participants belonged to Hindu religion (patients: 67.27%, controls: 84.17%) followed by Muslims (patients: 24.55%, controls: 12.92%) and Sikhs (patients: 8.18%, controls: 2.91%). On observing educational profile of the study participants it was observed that literacy rate was more in control group with percentage 82.08 on comparing to patients having a percentage of 69.5. The 37.08 percent of control subjects had pursued higher qualification (10^{th} and above) whereas major portion of patients (27.73%) had obtained a middle standard qualification (5^{th} - 8^{th}). Majority of the researchers' study subjects were married (patients: 93.64% and controls: 76.25%) and among the married subjects practice of consanguinity was mostly present in Muslim participants. In patients, 6.8 percent consanguinity rate was observed whereas in the control group it was 8.2 percent. Dwelling patterns of study subjects showed that maximum disease load was present in patients residing in urban areas of Jammu. The frequency of CVD cases reported from urban counterparts was 45.45 percent followed by 29.09 percent from rural and 25.46 percent from sub-urban counterparts of J&K. The observed socio-demographic parameters were summarised in Table 1.

Anthropometric, Physiometric and Biochemical Profiles in the Study Subjects

Anthropometric, physiometric and biochemical parameters were studied and these parameters showed a significant difference between cases and controls (Tables 2 and 3). SBP and DBP indicated significant ($p<0.0001$ and $p=0.0003$ respectively) differences in trait variance among patients and controls. Gender differences among patients have shown that both SBP (males: 142.79±19.53 vs females: 139.24±22.87) and DBP (males: 89.04±11.08 vs females: 88.28±10.99) was slightly higher in male patients than in female patients. There lies a strong significant difference between PP ($p=0.0005$) and PR ($p=0.0003$) values in patients and controls. BMI, WHR and BMR was significantly higher in patients than in controls ($p=0.002$, $p<0.0001$ and $p=0.03$ respectively). No significant difference was seen between BMI and WHR between male and female CVD patients. During the study course, the researchers enrolled male patients in greater number than female patients and in both the cases the incidence of CVD rose with increasing age (Table 2). The mean age of onset of CVD was 54.54±8.53 years for males and 49.45±16.49 years for females. There was a significant difference in pulse pressure ($p=0.0005$), fasting glucose (0.0001), Total cholesterol (TC) ($p=0.00001$), triglycerides (TG) ($p=0.00003$), low density lipoprotein (LDL) ($p=0.053$), high density lipoprotein (HDL) ($p=0.001$), urea ($p=0.00002$) and creatinine ($p=0.002$) except VLDL ($p=0.07$) and uric acid ($p=0.2$) among the cases in comparison to controls (Table 3). Among different metabolic factors, TC and LDL-C were higher in female patients in the judgment of male patients that is, TC: 223.32±34.87 vs. 202.55±24.55 and LDL-C: 142.15±29.11 *vs.* 115.67±38.93 respectively.

Lifestyle Risk Factors and Their Association with CVD

A variety of lifestyle or behavioral factors which can have a significant impact on a person's health were also investigated in the present study and were enlisted in Table 4. The incidence of smoking was higher in patients (37.73%) than in controls (16.67%). A higher incidence of smoking was observed among men than in women. The rates for current daily smokers, current occasional smokers, former and non-smokers

Table 1: Socio-demographic parameters of study subjects

Parameters	*Patients*			*Controls*		
	Men (n=140)	*Women (n=80)*	*Total (N=220)*	*Men (n=150)*	*Women (n=90)*	*Total (N=240)*
Religion						
Hindu	99 (70.71%)	49 (61.25%)	148 (67.27%)	134 (89.33%)	68 (75.56%)	202 (84.17%)
Muslim	27 (19.29%)	27 (33.75%)	54 (24.55%)	12 (8%)	19 (21.11%)	31 (12.92%)
Sikh	14 (10%)	4 (5%)	18 (8.18%)	4 (2.67%)	3 (3.33%)	7 (2.91%)
Educational Status	115 (82.14%)	38 (47.5%)	153 (69.55%)	137 (91.33%)	60 (66.67%)	197 (82.08%)
Primary	23 (16.43%)	11 (13.75%)	34 (15.46%)	38 (25.33%)	13 (14.44%)	51 (21.25%)
Middle	43 (30.71%)	18 (22.5%)	61 (27.73%)	43 (28.67%)	14 (15.56%)	57 (23.75%)
Higher	49 (35%)	9 (11.25%)	58 (26.36%)	56 (37.33%)	33 (36.67%)	89 (37.08%)
Illiterate	25 (17.86%)	42 (52.5%)	67 (30.45%)	13 (8.67%)	30 (33.33%)	43 (17.92%)
Marital Status						
Married	131 (93.57%)	75 (93.75%)	206 (93.64%)	111 (74%)	72 (80%)	183 (76.25%)
Unmarried	9 (6.43%)	1 (1.25%)	10 (4.54%)	39 (26%)	17 (18.89%)	56 (23.33%)
Widow	_	4 (5%)	4 (1.82%)	-	1 (1.11%)	1 (0.42%)
Consanguinity (For married)						
Yes	6 (4.58%)	8 (10.67%)	14 (6.80%)	6 (5.41%)	9 (12.5%)	15 (8.20%)
No	125 (95.42%)	67 (89.33%)	192 (93.20%)	105 (94.59%)	63 (87.5%)	168 (91.80%)
Region						
Jammu	119 (85%)	67 (83.75%)	186 (84.55%)	145 (96.67%)	85 (94.45%)	230 (95.83%)
Kashmir	14 (10%)	10 (12.5%)	24 (10.91%)	4 (2.67%)	3 (3.33%)	7 (2.92%)
Other States*	7 (5%)	3 (3.75%)	10 (4.54%)	1 (0.66%)	2 (2.22%)	3 (1.25%)
Dwelling						
Urban	72 (51.43%)	28 (35%)	100 (45.45%)	51 (34%)	22 (24.44%)	73 (30.41%)
Sub-urban	36 (25.71%)	20 (25%)	56 (25.46%)	25 (16.67%)	33 (36.67%)	58 (24.17%)
Rural	32 (22.86%)	32 (40%)	64 (29.09%)	74 (49.33%)	35 (38.89%)	109 (45.42%)

*Some patients enrolled from OPD were non-natives of J&K

were fifteen percent, 1.36 percent, 21.37 percent, and 62.27 percent among patients versus 8.33 percent, 2.92 percent, 5.42 percent and 83.33 percent among controls respectively. In the present study use of cigarette appeared to be the chief mode of smoking for both patients (61.45%) and controls (55%) whereas use of another form of smoking that is, *biddi* (a thin cigarette or mini-cigar filled with tobacco flake) (27.71% in patients versus 32.5% in controls) and *hukka* (single- or multi-stemmed instrument for vaporizing and smoking flavored tobacco)(10.84% in patients versus 12.5% in controls) was low. *Biddi* was mostly taken by individuals belonging to rural areas and *hukka* was confined to individuals with Kashmiri ethnicity. The habit of chewing tobacco was lower in both groups. Duration of smoking (in years of life) was significantly higher in the patient group (p=0.003). Male patients in the researchers' study reported the significantly higher incidence of alcohol intake than male controls (31.82% versus 7.08%, p<0.0001). All the women enrolled for the study were non-alcoholics. Physical activity was found to be significantly lower in CVD subjects in comparison to controls. Under physical activity, a majority of participants showed the habit of brisk walking for at least 30 minutes (patients: 42.73%, controls: 55.83%) and fewer subjects perform yoga (patients: 2.27%, controls: 7.5%). In a larger part of a patient group, sedentary behavior was found to be a prevalent risk factor in females (68.75%) than in males (47.14%). The habit of taking a non-vegetarian diet was more in CVD patients (70.91%) versus controls (50.83%). Female subjects of both patient (41.25%) and control (49.17%) group were seen to be vegetarians in contrast to male participants. It has been noticed from the collected data that consumption of saturated fats (clarified butter, *ghee*, *dalda vanaspati*) was prevalent in patients that is, 55.46 percent whereas the prevalence of taking unsaturated fats (mustard oil and refined oil) was higher in controls that is, 55.42 percent. Subjects with a positive family history of CVD, MI, HTN, and DM were at the higher risk of developing CVD and related complications when compared to the subjects with no family history of such complex diseases (Table 4). Many participants in the researchers' study were suffering from other associated health problems (Fig.1). Fifty-five percent of patients had a history of HTN and 15.91 percent had diabetes mellitus. The significantly higher frequency of psychological fac-

Table 2: Anthropometric variables of the study subjects

Parameters	Patients			Controls			P-value
	Men (n=140)	*Women (n=80)*	*Total (N=220)*	*Men (n=150)*	*Women (n=90)*	*Total (N=240)*	
Age (years)	57.96± 15.14	53.08± 14.35	56.18± 15.01	54.63± 17.09	41.96± 10.69	49.88± 16.20	
Age of Onset of CVD (years)	53.13± 15.32	51.73± 15.50	52.64± 15.50	-	-	-	
Duration of CVD (years)	6.11± 5.21	4.31± 4.54	5.45± 5.01	-			
BMI	24.41± 4.47	24.21± 5.89	24.34± 5.02	22.79± 4.33	23.39± 4.41	22.99± 4.42	0.002***
WHR	0.99± 0.08	0.98± 0.10	0.99± 0.09	0.96± 0.05	0.95± 0.06	0.96± 0.05	<0.0001***
BMR	1469.33±300.32	1245.99±156.65	1388.12±278.74	1365.46±260.37	1297.04±113.62	1338.68±217.46	0.03*

CVD: Cardiovascular Disease; BMI: Body Mass Index; WHR: Waist-Hip Ratio; BMR: Basal Metabolic Rate. *P <0.05, **P <0.001, ***P <0.0001

tors was observed in patients in judgment to controls. Among psychological factors, stress/ tension (66.25%) was most common than anger (63.75%) and headache (57.5%) in patients.

Logistic regression analysis (Table 5) of the study population showed a significant association of CVD with smoking, alcohol intake, lack of physical activity, non-vegetarian diet and family history of CVD and associated phenotypes. Smoking, physical inactivity, and non-vegetarian diet pattern were adding a risk of about 3 folds (p<0.0001), 2 folds (p=0.0001) and 2.4 folds (p<0.0001) respectively towards CVD. Strong family history of CVD/MI/HTN/DM in patients also showed an increased risk of developing CVD with an odds ratio of 8.10 (CI-5.33-12.30, p<0.0001).

DISCUSSION

It is estimated that eighty percent of global CVD related deaths is being reported form developing countries like India (Gupta et al. 2013). The burden of CVD can be predicted by estimating risk factor by standardized techniques. J&K state is not explored to a large extent regarding prevalence and nature of different cardiovascular risk factors. Looking into an increased load of cardiac patients in J&K, this is the high time to study prevalence and association of different socio-demographic, anthropometric, biochemical and lifestyle parameters with CVDs in the state with diversified ethnicity.

Although, people are more educated, well aware of cardio-risk factors and have got better healthcare accessibility in urban areas, still in general CVD is linked to disease of urban dwelling. The plausible justification may involve diet and lifestyle differences between residents of the urban and rural dwelling. Most of the patient participants of the researchers' study belonged to urban counterparts whereas controls belonged to rural counterparts of J&K. Recently, two separate studies from Jammu district of J&K also reported a higher prevalence of CVD risk factors in urban areas followed by semi-urban and rural settings (Raina et al. 2016; Sharma et al. 2016). Numerous epidemiological studies in India have also verified a higher prevalence of CVD in urban India as compared to rural counterparts (Gupta et al. 1995; De et al. 2013). Some Indian studies have projected a varying degree of ethnic differences in relation to prevalence of

Table 3: Physiometric and biochemical variables in the study subjects

Parameters	*Patients*			*Controls*			
	Men (n=140)	*Women (n=80)*	*Total (N=220)*	*Men (n=150)*	*Women (n=90)*	*Total (N=240)*	*P-value*
Blood Pressure (mm Hg)							
SBP	142.79±19.53	139.24±22.87	141.49±20.83	127.33± 8.26	121.12±5.85	125.01± 8.01	<0.0001***
DBP	89.04±11.08	88.28±10.99	88.75±11.03	87.7±11.11	81.2±4.77	85.26± 9.77	0.0003***
P P	53.75±18.09	50.96±16.87	52.74±17.67	39.63±10.98	39.94±4.05	39.75± 9.02	0.0005***
PR	81.01±11.24	86.24±17.63	82.91±14.05	73.38± 3.58	72.7±2.41	73.13± 3.19	0.0003***
Fasting Blood Sugar (mg/dl)	156.75±55.1	157.5±56.1	157.1±55.2	84.4± 8.6	81.0±7.6	82.4± 6.9	0.0001***
TC (mg/dl)	202.55±24.55	223.32±34.87	212.47±26.45	153.04±11.65	190.92±30.13	171.78±17.87	0.0000**
TG (mg/dl)	289.43±36.98	184.43±27.24	240.24±33.45	152.75±26.54	133.28±42.63	143.65±30.32	0.00003***
HDL- C (mg/dl)	37.35±4.14	45.39±7.01	41.23±5.02	40.11± 4.54	49.21± 6.83	44.89±21	0.001**
LDL-C (mg/dl)	115.67±38.93	142.15±29.11	129.48±36.89	94.21±11.46	112.34±24.86	102.34±22.56	0.053
VLDL-C (mg/dl)	46.76±33.42	39.04±17.90	42.87±25.49	41.90±22.79	35.1±12.21	38.04±17.69	0.07
Urea (mg/dl)	30.41±12.1	28.23±15.21	29.07±13.01	25.21±5.76	24.01± 4.2	24.32± 4.17	0.00002***
Creatinine (mg/dl)	1.2±0.4	1.24±0.36	1.2±0.39	1.02± 0.31	1.1± 0.21	1.14± 0.28	0.002**
Uric acid (mg/dl)	6.04±1.1	5.54±1.0	4.65±1.1	6.02± 1.1	5.6± 0.8	5.8± 1.02	0.2
Duration of Smoking (years)	24.15±13.12	16±13.05	23.07±13.32	12.89±15.95	30.5±34.64	13.77±16.95	0.003**
Duration of Tobacco Consumption (years)	18.19±17.64	13.5±16.26	17.67±17.09	15.86±16	28.5±37.48	18.67±19.97	0.89
Duration of alcohol intake (years)	20.51±14.13	_	20.51±14.13	10.59± 5.03	_	10.59± 5.03	<0.0001***
Duration of HTN (years)	8.36±6.36	7.27± 4.79	8.07±5.99	-	-	-	
Age of Onset of HTN (years)	54.06±12.29	45.96± 9.25	52.09±12.09				
Duration of DM (years)	5.9± 5.50	8.11±13.29	6.59± 8.49	-	-	-	
Age of Onset of DM (years)	54.54± 8.53	49.45±16.49	52.94±11.61				

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; PP: Pulse Pressure; PR: Pulse Rate; TC: Total Cholesterol; TG: Triglycerides; HDL-C: High Density Lipoprotein-cholesterol; LDL-C: Low Density Lipoprotein-cholesterol; VLDL-C: Very Low Density Lipoprotein-cholesterol; HTN: Hypertension; DM: Diabetes Mellitus.

$^{*}P < 0.05$, $^{**}P < 0.001$, $^{***}P < 0.0001$

Table 4: Prevalence of life style risk factors in the study subjects

Parameters	*Patients*			*Controls*		
	Men (n=140)	*Women (n=80)*	*Total (N=220)*	*Men (n=150)*	*Women (n=90)*	*Total (N=240)*
Smoking	72 (51.43%)	11 (13.75%)	83 (37.73%)	38 (25.33%)	2 (2.22%)	40 (16.67%)
Current daily smokers	26 (18.57%)	7 (8.75%)	33 (15%)	18 (12%)	2 (2.22%)	20 (8.33%)
Current occasional smokers	3 (2.15%)	-	3 (1.36%)	7 (4.67%)	-	7 (2.92%)
Ex-smokers	43 (30.71%)	4 (5%)	47 (21.37%)	13 (8.66%)	-88 (97.78%)	13 (5.42%)
Non-smokers		68 (48.57%)	69 (86.25%)	137 (62.27%)	112 (74.67%)	200 (83.33%)
Mode of Smoking						
Cigarette	48 (66.67%)	3 (27.27%)	51 (61.45%)	22 (57.89%)	-	22 (55%)
Biddi	16 (22.22%)	7 (63.64%)	23 (27.71%)	11 (28.95%)	2 (100%)	13 (32.5%)
Hukka	8 (11.11%)	1(9.09%)	9 (10.84%)	5 (13.16%)	-	5 (12.5%)
Chewing Tobacco						
Current	9 (6.43%)	-	9 (4.09%)	3 (2%)	2 (2.22%)	5 (2.08%)
Former	5 (3.57%)	2 (2.5%)	7 (3.18%)	4 (2.67%)	-	4 (1.67%)
Never	126 (90%)	78 (97.5%)	204 (92.73%)	143 (95.33%)	88 (97.78%)	231 (96.25%)
Alcohol Intake	70 (50%)	-	70 (31.82%)	17 (11.33%)	-	17 (7.08%)
Current occasional alcoholics	39 (27.86%)		39 (17.73%)	15 (10%)		15 (6.25%)
Current regular alcoholics	12 (8.57%)	_	12 (5.45%)	2 (1.33%)	_	2 (0.83%)
Former alcoholics	19 (13.57%)	_	19 (8.64%)	_	_	_
Non-alcoholics	70 (50%)	80 (100%)	150 (68.18%)	133 (88.67%)	90 (100%)	223 (92.92%)
Physical Activity						
Walk	69 (49.29%)	25 (31.25%)	94 (42.73%)	92 (61.33%)	42 (46.67%)	134 (55.83%)
Yoga	5 (3.57%)	-	5 (2.27%)	10 (6.67%)	8 (8.89%)	18 (7.5%)
Sedentary	66 (47.14%)	55 (68.75%)	121 (55%)	48 (32%)	40 (44.44%)	88 (36.67%)
Eating Habit						
Vegetarian	31 (22.14%)	33 (41.25%)	64 (29.09%)	69 (46%)	49 (54.44%)	118 (49.17%)
Non-vegetarian	109(77.86%)	47 (58.75%)	156 (70.91%)	81 (54%)	41 (45.56%)	122 (50.83%)
Former non-vegetarian (from vegetarians)	9 (29.03%)	3 (9.09%)	12 (18.75%)	7 (10.14%)	2 (4.08%)	9 (7.63%)
Fats Intake						
Saturated	79 (56.43%)	43 (53.75%)	122 (55.46%)	45 (30%)	21 (23.33%)	66 (27.5%)
Unsaturated	37 (26.43%)	25 (31.25%)	62 (28.18%)	75 (50%)	58 (64.45%)	133 (55.42%)
Both	24 (17.14%)	12 (15%)	36 (16.36%)	30 (20%)	11 (12.22%)	41 (17.08%)
Salt Consumption						
Low	19 (13.57%)	14 (17.5%)	33 (15%)	29 (19.33%)	24 (26.67%)	53 (22.1%)
Average	94 (67.14%)	49 (61.25%)	143 (65%)	105 (70%)	59 (65.55%)	164 (68.3%)
Too much	27 (19.29%)	17 (21.25%)	44 (20%)	16 (10.67%)	7 (7.78%)	23 (9.6%)
Psychological Factor						
Stress/Tension	83 (59.29%)	53 (66.25%)	136 (61.82%)	26 (17.33%)	20 (22.22%)	46 (19.17%)
Headache	37 (26.43%)	46 (57.5%)	83 (37.73%)	10 (6.67%)	16 (17.78%)	26 (10.83%)
Anger	97 (69.29%)	51 (63.75%)	148 (67.27%)	30 (20%)	15 (16.67%)	45 (18.75%)
History of HTN						
Yes	87 (62.14%)	34 (42.5%)	121 (55%)	-	-	-
No	53 (37.86%)	46 (57.5%)	99 (45%)	150 (100%)	90 (100%)	240 (100%)
History of DM						
Yes	24 (17.14%)	11 (13.75%)	35 (15.91%)	-	-	-
No	116 (82.86%)	69 (86.25%)	185 (84.09%)	150 (100%)	90(100%)	240 (100%)
Family History						
CVD	35 (25%)	12 (15%)	47 (21.36%)	11 (7.33%)	5 (5.56%)	16 (6.67%)
MI	5 (3.57%)	1 (1.25%)	6 (2.73%)	3 (2%)	1 (1.11%)	4 (1.67%)
HTN	41 (29.29%)	27 (33.75%)	68 (30.91%)	12 (8%)	13 (14.44%)	25 (10.42%)
DM	28 (20%)	17 (21.25%)	45 (20.46%)	10 (6.67%)	11 (12.22%)	21 (8.75%)

HTN: Hypertension; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; MI: Myocardial Infarction.

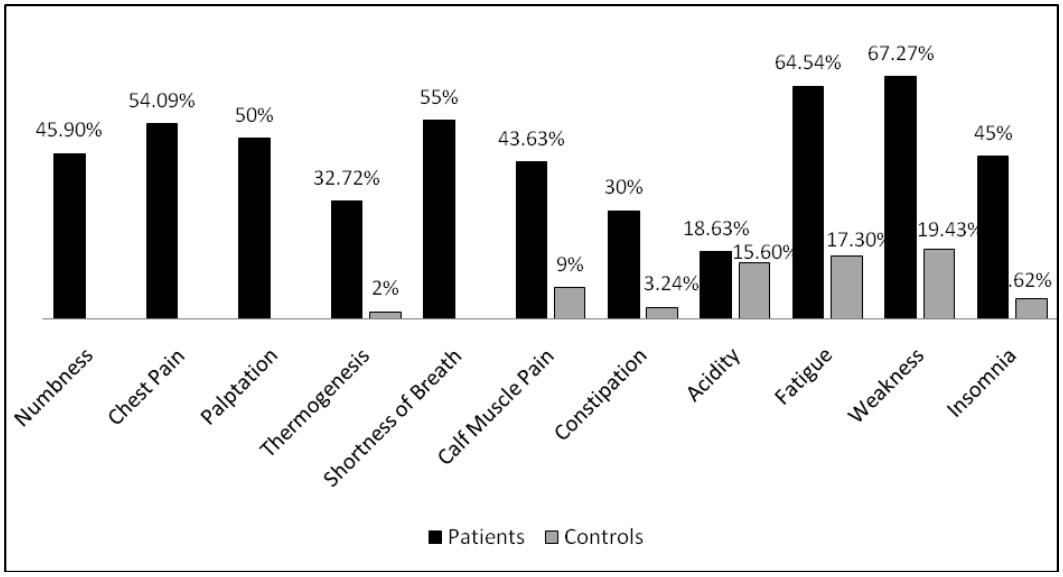

Fig. 1. Prevalence of health associated problems in study participants

CVD with one report indicating high prevalence rates of coronary heart disease in Muslim men (Gopinath et al. 1995) the other showing high prevalence in Hindu men (Gupta et al. 2002). In context to socio-ethnic parameters, the researchers' study demonstrated a high prevalence of different cardiovascular phenotypes in Hindus followed by Muslims and Sikhs. Majority of the researchers' enrolled subjects were married. Hong et al. (2018) also reported a higher frequency of married participants in their study.

Obesity (BMI >25) and dyslipidemia are considered as a substantial risk factor for chronic cardiovascular conditions (Wilson et al. 2002). Higher mean value for BMI and WHR and higher levels of serum LDL, TC and TGs and lower lev-

Table 5: Univariate association analysis of different risk factors for CVD

Parameters	*Patients (n=220)*	*Controls (n=240)*	*Odds ratio (95%ci)*	*P-value*
Smoking				
Yes	83	40	3.03 (1.96-4.68)	<0.0001***
No	137	200		
Tobacco Chewing				
Yes	16	9	2.01 (0.87-4.65)	0.1
No	204	231		
Alcohol Intake				
Yes	70	17	6.12 (3.46-10.81)	<0.0001***
No	150	223		
Physical Inactivity				
Yes	121	88	2.11 (1.45-3.07)	0.0001**
No	99	152		
Diet Pattern				
Non-vegetarian	156	122	2.36 (1.60-3.47)	<0.0001***
Vegetarian	64	118		
Family History CVD/MI/HTN/DM				
Yes	166	66	8.10 (5.33-12.30)	<0.0001***
No	54	174		

HTN: Hypertension; DM: Diabetes Mellitus; CVD: Cardiovascular Disease; MI: Myocardial Infarction.
*$P < 0.05$, **$P < 0.001$, ***$P < 0.0001$.

els of serum HDL in patients were observed in the researchers' study. Several competent workers in their research reports have also projected similar results (Iqbal et al. 2004; Iyer et al. 2011; Kalra et al. 2011; Gupta et al. 2012; De et al. 2013; Raina et al. 2016). In a comparison based study conducted on natives of five middle income countries, Ogunsina et al. (2018) reported the lowest rate of obesity as a cardio-metabolic risk factor in India, with the prevalence of 134 and 232 per 1000 for men and women respectively. These findings were not compatible with the present investigation as the researchers' have reported higher mean values of BMI in patients which suggest that obesity was one of the potential risk factors for CVD development in the researchers' study.

Tobacco smoking is considered an independent risk factor for CVDs. The chance of having a heart attack becomes double to a cigarette smoker than to a non-smoker and the threat increases eight times in presence of other main cardiac risk factors (Achari and Thakur 2004). The researchers' identified smoking tobacco as a potent risk factor for CVD development in the researchers' study in comparison to chewing tobacco. Similar findings were reported by Iyer et al. (2004) Kalra et al. (2011) and Achari and Thakur (2004) whereas Iqbal et al. (2004) and Deb and Dasgupta (2008) reported a lower prevalence of smoking. The positive role of smoking in developing CVD among the population of Jammu was also ascertained by Sharma et al. (2016). On contrary to the researchers' results, Yadav et al. (2010) identified tobacco chewing as the main risk factor for the acute coronary syndrome. In relation to alcohol consumption, researchers have concluded that moderate intake of alcohol is related to lower risk of developing CAD although heavier drinking is associated with cardiomyopathy, HTN, and arrhythmias (Pletcher et al. 2005). In a follow- up study named Coronary Artery Risk Development in Young Adults (CARDIA) showed that heavier alcohol consumption during young years of a lifetime was associated with coronary calcification (Pletcher et al. 2005). Heavy alcohol intake has emerged as a significant risk factor for the development of CVD in researchers' study. The results are comparable to the studies done by De et al. (2013) and Iyer et al. (2004). In contrast to the researchers' results, alcoholism was found to be inversely associated with non-fatal CHD risk in recent times (Ricci et al. 2018). Habitual physical activity reduces the risk of obesity, lipid abnormalities, HTN, and diabetes mellitus and has also been shown to reduce substantially the risk of cardiovascular phenotype like CAD. Higher frequency of sedentary lifestyle is exhibited by the patient group in the present study while the researchers' control group is involved in a regular workout in any form (walk/yoga). The results are inconsistent with the findings of other researchers (Iqbal et al. 2004; Iyer et al. 2004; Kalra et al. 2011; Raina et al. 2016). International cohort studies also found a sedentary lifestyle as an important risk factor for CVD (Tanuseputro et al. 2003). It is a general remark that North Indians are "mad over food" and are passionate for non-vegetarian, spicy, oily and utterly-buttery food. High intake of caloric foodstuffs and saturated fats along with lack of physical activity has a direct impact on human health. Apart from vegetarian diet, diet rich in dietary fibres and fruits imparts lower CVD risk by improving lipid profile, lowering BP and increasing insulin sensitivity (Bazzano et al. 2003). It was shown by Chen et al. (2009) that dietary fats increase the risk of the Asian population to develop the metabolic syndrome (like T2DM). Since, J&K state is well known for Kashmiri cuisine which apart from the delicacy is a supplement of oil, calories, and fats. So, the results of the present study revealed the association between high dietary saturated fats and non-vegetarian diet with CVD. Gupta et al. (2012) reported a high fat intake with the percentage of 51.2 as a cardiovascular risk factor which is comparable to the researchers' study showing the percentage of 55.46 in cardiac patients. High prevalence of non-vegetarianism and low prevalence of vegetarianism is found to be associated with CVD in the present study which was in concordance with a study done by Raina et al. (2016). In fact, it has been established that serum cholesterol level is higher among non-vegetarians as compared to vegetarians (Gui et al. 2010). Both diabetes and HTN are responsible for the awful cardiovascular profile. Prevalence of HTN as a co-morbid condition is higher in comparison to DM in the present study which is in line with other studies (Raina et al. 2016; Sharma et al. 2016). In a cross-sectional survey based study done in Nanjing, adults of China have estimated a higher prevalence and clustering of CVD risk factors such as hypertension, dyslipidemia and overweight or obesity (Hong et al. 2018).

Familial factors play an imperative role in the variation of risk factors of CVD. Siblings of patients with CVD have about forty percent risk increase, while offspring of parents with premature CVD have a sixty percent to seventy-five percent risk increase (Kolber and Scrimshaw 2014). In the researchers' study, a strong familial aggregation of CVD or related phenotypes is adding approximately 8 folds risk towards CVD predisposition which suggests a genetic background.

Apart from conventional risk factors, psychological factors (stress, tension, anxiety, anger, and headache) have been implicated to perform an integral role in the pathophysiology of CVD. If the cardiac patients happens to remain in a continual state of emotional distress the chances of experiencing a heart attack increases and also increases their risk of death (Blumenthal et al. 2001). The present study revealed a higher prevalence of psychological factors like stress/ tension, headache, and anger with CVDs. The datum is in accordance with studies done by Rasul et al. (2005) and Nehra et al. (2012).

CONCLUSION

The present study has figured out, a high prevalence of risk factors for CVD in particular lifestyle variables such as smoking, alcohol intake, physical inactivity, non-vegetarian diet and family history of CVD. HTN appeared to be a significant and potent risk factor in comparison to DM for CVD. Among metabolic parameters, the serum levels of LDL-C, TC and TG were higher while low levels of HDL-C were found in patients thereby indicating that dyslipidemia was a potent risk factor for CVD.

RECOMMENDATIONS

Thus, this study was an attempt to present a more comprehensive picture of the recognition and prevalence of different risk factors associated with CVD in the population of J&K. The data so generated will be helpful to healthcare providers and to the general public to be aware of the association of these risk factors with the development and progression of CVD. The present study will be helpful for the establishment of better and effective approaches for prevention and management of the disease in context with sociodemographic distribution of people of J&K state.

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