Original Article

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Behavioural risk factors associated with ischemic heart disease among population attending selected cardiac hospitals of Kathmandu, Nepal

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Abstract

Background and Aims: Ischemic Heart Disease (IHD) is the number one cause of morbidity and mortality among the in-patient of different cardiac hospital of developing countries like Nepal. The prevalence of IHD is high with significant associated risk factors that include tobacco use, history of hypertension, family history and age. The objective of the study was to study the risk factors associated with ischemic heart diseases among population attending selected cardiac hospitals of Kathmandu.

Methods: Hospital- based pair matched case-control was conducted among the patients with IHD at Manmohan Cardiothoracic Vascular and Transplant Centre (MCTVC) and Shahid Gangalal National Heart Center (SGNHC). Univariate associations between the risk factors and IHD under study was assessed by applying Chi-Square test and Fisher's exact test and expressed as odds ratios with 95% confidence intervals .To assess the strength of association, the odds ratio was calculated.

Results: 88.6% cases and 90% controls participants were of age 41 years and above and IHD was more common in male (60%) than female (40%). The participants who were not doing work-related moderate-intense activity are twice more likely to have IHD compared to controls (OR=2.276, p=0.049), similarly, hypertensive are two times (OR=2.276, p=0.049), obese are more than two times (OR=2.44, p=0.045), and participants with high waist to hip ratio are almost three times more likely to suffer from IHD (OR=2.88, p=0.013).

Conclusions: The current smoking, physical inactivity, hypertension and waist to hip ratio tend to be the significant risk factors of IHD. Minimizing exposure to the identified risk factors can prevent burden of complex and expensive IHD treatment.

Keywords: Ischemic Heart Diseases; Matched Case-control studies; Risk factors.

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Introduction

Cardiovascular diseases (CVDs) are the most common causes of death globally. Annually, more people die from CVDs than from any other causes. An estimated 17.7 million people died from CVDs in 2017. Over 80% of CVD deaths take place in low- and middle-income countries and occur almost equally in men and women.[1] By 2020, CVDs which include ischemic heart diseases are expected to be the major cause of morbidity and mortality in low- and middle-income countries.[2]

Previous research has indicated that modifiable risk factors which are directly related to human include life style or behavioral risk factors i.e. using tobacco, physical inactivity, the harmful use of alcohol and unhealthy diets.[1] In Nepal, the prevalence of conventional risk factors like smoking, diabetes mellitus, hypertension and dyslipidemia among coronary artery disease are high[3] but the detail study of behavioral risk factors among ischemic heart disease population is still sparse.

The objective of the study was to study risk factors associated with Ischemic heart diseases among population attending selected cardiac hospitals of Kathmandu.

Methods and materials

The study is hospital based pair matched case control (1:2) study on behavioral risk factors of IHD patients admitted in selected cardiac hospitals in the duration of four weeks. Patients were used as subjects of study so great care was exercised to protect their right. Ethical consideration was maintained by taking written permission from Institutional review board, Institute of medicine for the study. Informed written consent was obtained prior to information collection, after explaining about the purpose of the study to all the participants. Only interested participats were included in the study. Confidentiality of the subject was ensured by collecting data in separate private room and using code numbers while analyzing data. Identification of the clients was protected at all time during and after the study.

Selection of cases and controls

The population of this study was 105 participants (35 cases and 70 controls) of which 10 cases and 20 controls from SGNHC and 25 cases and 50 controls were taken from MCTVC hospital. The participants, who were available at the time of data collection irrespective of their age, sex, cast, religion and occupation, and who were admitted in inpatient department of medicine at MCTVC and SGNHC and agreed to participate in the study were only taken as population.

Selection criteria for cases

Definition of cases

Present study included newly diagnosed cases of clinically diagnosed with IHD (I20-I25).

Inclusion criteria for Cases

The patients who were diagnosed for the first time as a patient with IHD were included to avoid bias arising from recall memory. Participants who were well conscious, co-operative, and well oriented with time, place and person were only selected to avoid bias from participant's answers.

Exclusion criteria for cases

Those who were admitted in critical care unit, and had psychiatric disorder or were critically ill and disability in terms of having neurological problems were excluded from the study.

Selection criteria for controls

Definition of control

A control was defined as an individual who was admitted in MCTVC and SGNHC on the same day or within 7 days for conditions other than IHD (I20-I25).

It was assured that the control had never been admitted to hospital or taken treatment for IHD. Patients attending the hospital for pneumonia, hemothorax, and pneumothorax, fall injury on chest, lobectomy, lungs bullae, Rheumatic Heart disease, cellulitis, and wound infection were preferred as controls. Controls with no prior history of heart disease or exertional chest pain were included.

Inclusion criteria for Control

The population who was admitted on the same day or within 7 days for conditions other than IHD. Well conscious, co-operative, and well oriented with time, place and person were selected to avoid bias from respondent's answers.

Exclusion criteria for cases

Those who were admitted in critical care unit, who had psychiatric disorder, who was critically ill and disability in terms of having neurological problems or who had history of IHD.

Matching

For each case, age- and sex-matched controls (1:2) were selected; age matching was done with the liability of ± 2 years of age.

Sampling

The consecutive sampling technique was used to collect data from cases and controls.

The sample size of the study is calculated by using following formula 4

$$N = \frac{(Z\ 1\text{-}\alpha/2 + Z\ 1\text{-}\beta)\ 2\ p\ q\ (r+1)}{(P\ 1\text{-}P\ 2)2\ r}$$

Where,

$\alpha = 0.05$ (allowed type I error)

$\beta = 0.2$ (allowed type II error)

So for these values of type I and type II errors, the values of power of detecting these errors are as under;

$Z\ 1\text{-}\ \alpha/2 = 1.96$ and

$Z\ 1\text{-}\ \beta = 0.84$

$P\ 1 = 0.45$ proportion of smokers among the cases in previous study 5

$P\ 2 = 0.158$ proportion of smokers among the controls in previous study 6

$p = (P\ 1 + P\ 2)/2 = 0.304$

$q = 1\text{-}\ p = 0.696$

r = ratio of number of controls to cases, here it was 2.

Putting all these values to the above-mentioned equation, the desired sample size was found to be 29.27 ≅30 .As the case: control ratio was kept 1: 2, the final total sample size of study was taken as 35 cases and 70 controls.

WHO NCD STEPS instrument version 2.2 was accessed through the open source.[6] Data on socio-demographic characteristic and risk factors of IHD was collected by face-to-face interview technique of cases and controls using pretested software (ODK collection) with (personal device for assistant) PDA from in separate room of MCTVC and SGNHC. The participants were explained the purpose of the study and informed consent was obtained from the participants before conducting the interview. The data was collected by the investigator herself.

The interview schedule was checked for completeness and consistency. The different variables of the interview schedule was coded and double-checked. The collected datasets were stored in the device and sent to data centers daily. After completing files from the PDA to data centers the data was then transferred to the personal computer in the form of Microsoft Excel and stored. Statistical analysis was done by using SPSS software version 20. Investigator then carefully analyzed data under guidance.

Univariate associations between the risk factors and IHD under study was assessed by applying Chi-Square test and Fisher's exact test and expressed as odds ratios with 95% confidence intervals .To assess the strength of association, the odds ratio was calculated.

Results

A total of 35 cases of Ischemic heart diseases and 70 matched controls were analyzed. Among the cases and control, 60 % were male and 40 % were female. The mean age of cases was 61± 12 years and control was 60± 12 years, largest number of case were present in the age group 41 and above years (88.6%). (Table 1)

Table 1: Age and sex wise distribution of Cases and Controls

Age	Case (n=35)						Control (n=70)					
Age Group (in years)	Male		Female		Total		Male		Female		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
≤40	2	5.71	2	5.71	4	11.4	3	4.28	4	6	7	10
41 and above	19	54.3	12	34.3	31	88.6	39	55.7	24	34	63	90
Total	21	60	14	40	35	100	42	60	28	40	70	100

Mean age group (SD) of cases were 61± 12 years and controls was 60 ± 12 years

Body mass index (BMI) was used to classify the weight status of clients. It was derived by dividing the weight in kilograms by the square of the height in meters (kg/m^2). Classification of overweight and obesity was done according to WHO criteria.

Majority of cases and controls were under normal weight category. Regarding over weight category cases was nearly double (40%) than controls (21%). Mean BMI were 24.85(±4.82) and 22.33(±4.17) of cases and control respectively. (Table2)

Table 2: BMI distribution of Cases and controls

	BMI							
Type of study group	Under weight		Normal weight		Over weight		Total	Mean(SD)
	n	%	n	%	n	%		
Case	1	3	20	57	14	40	35	24.85(±4.82)
Control	9	13	46	66	15	21	70	22.33(±4.17)
Total	10	10	66	63	29	28	105	

Smokers were more among the cases (80%) as compared to controls (70%). There was significant difference between current smoking habit (OR=3.115, p=0.035) between the two groups whereas no difference in their past smoking habits were noted. Among cases and controls, most of them (71.43% and 78.6% respectively) do not use smokeless tobacco. No significant difference was present between two groups regarding the use of smokeless tobacco. Majority of the cases (51.43%) and controls (57.1%) consumed alcohol (social drinker) but there is no significant difference between them in respect to alcohol consumption (OR=0.794, p=0.579).

Regarding consumption of fruits and vegetables, majority from both the groups consumed fruits and vegetables less than 3 days per week and less than 3 servings per day. There was no significant difference between fruits (OR=1.987, p=0.12) and vegetables (OR=2, p=.39) consumptions among them.

Regarding work related physical activity, 97.14% of cases and 72.86% of controls did not have habit of doing vigorous-intensity at least 10 minutes continuously which was significantly different (OR=12.667, p=0.003) and majority 54.29% and 65.71% did not have habit of doing moderate-intensity at least 10 minutes continuously in cases and controls group respectively which was also significantly different (OR=2.276, p=0.049). BMI of participants revealed that 40% of cases and 21.42% of controls were obese and there is significant difference between two groups (OR=2.444, p=0.045). There was significant difference between cases (65.71%) and controls (60%) in regard to waist to hip ratio (OR=2.875, p=0.013). (Table 3)

Table 3: Risk factors of Ischemic heart disease among case and control

Risk factors	Cases		Controls		Odds Ratio	95% CI	p -value
	n=35	%	n=70	%			
Smoking							
Yes	28	80	49	70	1.547	0.606- 3.946	0.359
No	7	20	21	30			
Current Smoker	9	32.14	7	14.3	3.115	1.049- 9.25	0.035*
Past Smoker	19	67.86	42	85.7	1.307	0.515- 3.318	0.578
Smokeless tobacco use							
Yes	9	25.71	15	21.4	0.788	0.305- 2.035	0.622
No	26	74.29	55	78.6			
Alcohol Consumption							
Yes	18	51	40	57	0.794	0.352-1.793	0.579
No	17	49	30	43			
Fruit Consumption (Days/week)							
≤3	25	71.43	39	55.71	1.987	0.831-4.752	0.12
>3	10	28.57	31	44.29			
Mean days/week(SD)	3 (± 3)	4(±3)					
Fruit Servings/day							
≤3	33	94.29	67	95.71	0.739	0.118-4.638	1
>3	2	5.71	3	4.29			
Mean servings per day(SD)	2(±1)	2(±1)					
Vegetable Consumption (Days/week)							
≤3	3	8.57	2	2.86	2	0.5- 7.997	0.39
>3	32	91.43	68	97.14			
Mean days/week(SD)	6(±1)	7(±1)					
Vegetable Servings/day							
≤3	34	97.14	64	91.43	3.188	0.369-2.757	0.24
>3	1	2.86	6	8.57			
Mean servings per day(SD)	2(±1)	2(±1)					
Vigorous-intensity at least 10 minutes continuously							
No	34	97.14	51	72.86	12.667	1.619-99.101	.003*
Yes	1	2.86	19	27.14			
Moderate-intensity at least 10 minutes continuously							
No	19	54.29	24	34.29	2.276	0.994-5.210	.049*
Yes	16	45.71	46	65.71			
BMI							
≥25 kg /m2	14	40	15	21.43	2.44	1.009-5.923	.045*
<25 kg /m2	21	60	55	78.57			
Waist to hip ratio							
≥0.9(Men), ≥0.8(Women)	23	65.7	28	40	2.88	1.234- 6.7	.013*
<0.9(Men), <0.8(Women)	12	34.3	42	60			

*Chi Square test significant at p ≤ 0.05

Majority of cases (60%) were hypertensive as compared to controls (37.1%) and this difference was statistically significant (OR=2.54, p=0.026). 65.71% of the cases and 51.4% of the controls had Diabetes Mellitus but there is no significant difference (OR=1.81, p=0.164). (Table 4)

Table 4: Hypertension and diabetes mellitus among cases and controls

Risk factors	Cases	Controls	Odds Ratio	95% CI	p -value		
	n=35	%	n=70	%			
Hypertension							
Yes	21	60	26	37.1	2.54	1.105 - 5.834	0.026*
No	14	40	44	62.9			
Diabetes Mellitus							
Yes	23	65.7	36	51.4	1.81	0.781 – 4.196	0.164
No	12	34.3	34	48.6			

*Chi Square test significant at p ≤ 0.05

Distribution of Odd ratios and confidence intervals of cases and controls

Participants who currently smoke are three times more likely to develop IHD compared to the control. Participants not doing work-related vigorous-intense activity are 13 times at greater risk of having IHD and those who were not doing work-related moderate-intense activity are two times, whereas, hypertensive are two times, obese are three times and those with raised waist to hip ratio are three times more likely to develop IHD. (Figure 1)

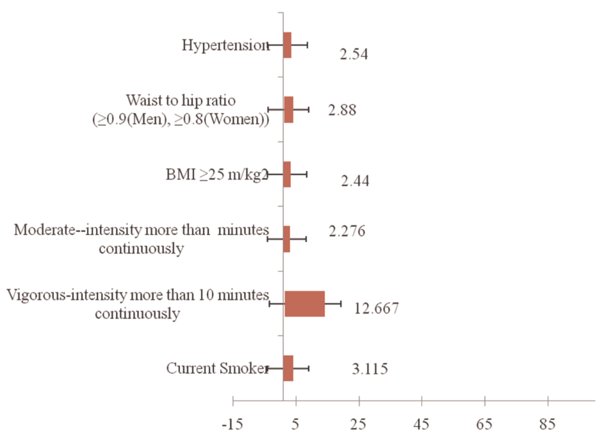

Figure 1 Distribution of Odd ratios and confidence intervals of cases and controls

DISCUSSION

The present study was designed as hospital-based case-control study to assess the role of various behavioral risk factors in the occurrence of Ischemic heart disease among the participants attending inpatient department of MCTVTH and SGNHC.

Regarding socio-demographic characteristics of the respondents, among total 35 cases, 60 % were male and 40 % were females, male predominance has been also reported in the study conducted by Ram and Trivedi in India.[5] Male dominance might be due to the increase prevalence of heart disease among male than female. The mean age of cases was 61± 12 years, largest number of case were present in the age group 41 and above years (88.6%) which is well- correlated with the findings of India.[5]

There is incontrovertible evidence that tobacco, in any form (smoked or chewed), is a major risk factor of CAD.[6,7] In present study smokers were more among the cases (80%) as compared to controls (70%) and there was significant associations observed between current smoking and Ischemic heart disease (OR=3.115, p=0.035). However, no significant association was observed between smokeless tobacco consumption and coronary artery disease (OR=0.788). The contradictory finding have been also reported in study conducted in Bandaladesh.[8]

Regarding alcohol consumption among cases and control, no significant difference was noted (OR=0.794, p=0.579). Similar finding was observed where no significant statistical association was found between the habit of drinking alcohol and CHD.[5]

Regarding consumption of Fruits and Vegetables, 71.43% of the cases and 55.71% of the controls consumed fruits less than 3 days per week and 94.29% of cases and 95.71% of controls consumed fruits less than 3 servings per day. This is much less than WHO recommended intake of 400 to 500 grams per day. There was no significant difference between fruits consumptions in two groups. Similarly, 91.43% of the cases and 97.14% of the controls consumed Vegetables more than 3 days per week and 97.14% of cases and 91.43% of controls consumed Vegetables less than 3 servings per day with no significant difference between Vegetables consumptions in two groups. In contrary to this study, increased consumption of fruit and vegetables from less than 3 to more than 5 servings/day is related to a 17% reduction in CHD risk, whereas increased intake to 3–5 servings/day is associated with a smaller and borderline significant reduction in CHD risk.[9] Due to the lack of knowledge about benefit of >5 serving /day intake of fruits and vegetables as recommended by WHO, both cases and controls had habit of less intake of fruit and vegetable.

Regarding work related physical activity majority 97.14% of the cases and 72.86% of the controls did not have habit of doing vigorous-intensity at least 10 minutes continuously which was significantly different (OR=12.667, p=0.003) and 54.29% of the cases and 65.71% of the controls did not have habit of doing moderate-intensity at least 10 minutes continuously which was also significantly different (OR=2.276, p=0.049). The finding was supported by a study conducted in Norway where it was reported that moderate or high-intensity exercise had a somewhat lower risk of death than those who exercised with low intensity.[10] Increase of sedentary life style might be the reasons behind the low vigorous- intensity and moderate- intensity activity. Lack of adequate work related activity is also a leading risk factor of IHD.

Majority (62.86%) of both cases and controls had habits of travel related physical activity that was not significantly different. Regarding recreational related vigorous-intensity at least 10 minutes continuously, all the cases had no habit of physical activity where as only 1.014% of control had the habit of physical activity. This might be due to lack of awareness regarding importance of recreational related activity and prevention of risk of IHD. This finding was not significantly different. In contrary to this study, the study done in North Dakota shows insufficient leisure time physical activity (LTPA) was significantly associated with greater prevalence of 'high risk' of CHD.[11]

Regarding hypertension, majority of cases (60%) were hypertensive as compared to controls (37.1%) and this difference statistically significant as Chi Square is <0.05. Similar finding was observed in study conducted in India where there were significant difference between hypertension and Acute MI.[12] Regarding Diabetes Mellitus (DM), 65.71% of the cases and 51.4% of the controls had Diabetes Mellitus without significant difference between two groups (OR=1.81, p=0.164). Similar finding was found in the study conducted in India.[13] The presence of DM in both of cases and control might be due to the factor that DM is now more prevalent among hospitalized patient age group of >40 years of age. Regarding obesity according to BMI classification, 40% of cases and 21.42% of the controls were obese and there is significant difference between them (OR=2.444, p=0.045). Similar prevalence was found in the study of prevalence of risk factors of cardiovascular disease.[13]

Waist circumference and waist to hip ratio majority of case and control (74.29%) in both group were central obese as their waist circumference were ≥ 85cm in Men and ≥80cm in Women and there was no significant difference between them. Majority of case (65.71%) were having waist to hip ratio of ≥0.9(Men), ≥0.8(Women) and in control majority 60% of them were having waist to hip ratio of≥0.9(Men), ≥0.8(Women). There was significant difference between cases and controls in regard to waist to hip ratio (OR=2.875, p=0.013). The study finding is well supported by that of Dev (2008) as there was significant association of increased waist hip ratio with IHD. Central obesity is one of the risk factors of IHD.[13]

In spite of pair-matched sampling with employment of 1:2 matching for cases and control, a higher number of controls per case could have provided precise estimates; but was not pursued for lack of resources for a study larger than 105.This study was carried on among hospitalized diagnosed cases of AMI only. Thus study results could only be generalized to tertiary care health services across central Nepal.

Conclusion

The current smoking, physical inactivity, hypertension and waist to hip ratio tend to be the significant risk factors of IHD. Minimizing exposure to the identified risk factors can prevent burden of complex and expensive IHD treatment. By implementing effective strategies, which focus on prevention and control, it would be possible to reduce the burden of the disease while also decreasing the associated various risk taking behavior.

Limitation

In spite of pair-matched sampling of controls, the inherent limitation of confounding error adversely influencing the results of univariate analysis done in this study cannot be ignored. Interaction or effect modification due to synergism of multiple variables was not explored due to small size of the study sample. Though case-control study employed 1-2 matching for cases and control, a higher number of controls per case could have provided precise estimates; but was not pursued for lack of resources for a study larger than 105.

Recommendation

Findings of our study suggest that modifiable and preventable various behavioral risk factors are important etiology behind the prevalence of IHD. Public health remedial measures, therefore, be urgently implemented to minimize the significant proportion of premature morbidity and mortality due to IHD. To obtain the relative importance of various risk factors, multivariate analysis using forward step down logistic regression statistical model is recommended for further research.

Conflict of interest

The authors do not have any conflict of interest including financial in publication of this article.

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