ORIGINAL ARTICLE

Cardio vascular risk assessment in Medical Students of a tertiary care center in Nepal

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Abstract

Introduction: Episodes of cardiovascular ailments in general is increasing and certain characteristics have been found to be linked with increase in risk of Cardiovascular disease. Medical profession too is not free of these associations.

Objective: To determine the prevalence of cardiovascular risk behaviors among students at a medical college in Pokhara.

Methods: 165 students were studied. Cardiovascular Risk Assessment Questionnaire, a standard set of questions, was used to estimate the cardiovascular risk scores. Anthropometric measurements were taken.

Results: Almost 30% of women and only 9% of men indicated low physical activity. Anxiety, depression, and irritability have been reported by both men and women at high frequency (40% vs. 50%, 50% vs. 68%, and 53% vs. 63%, respectively). Both men and women used antibiotics at extremely high rates (97% vs. 94%). Tobacco/alcohol intake was prevalent in 14.6% /8.5% respectively. High CVD risk ratio was found in 3%. Around 38% of the students were having low physical activity with overall overweight/obesity rate at 43%. In the multiple response analysis, the very high percent of cases reported taking fried food 84.8%, starchy food 77.6% and soft drink 68.5% in high amount. Gender, mediation practice, family history of CVD and diabetes, feeling anxious, depression, irritability and physical activity were found to be significantly associated with risk of CVD.

Conclusion: High prevalence of many of the risk factors mentioned in Interheart and Interstroke studies is the matter of sincere concern and working toward preventing this ticking time bomb from exploding should be our priority.

Introduction

Cardiovascular disease-related deaths are increasing, especially in low- and middle-income nations. Heart-related mortality has been on the rise in India lately[1], and Nepal is not immune to this trend either. Sixty percent of all deaths in Nepal in 2014 came from non-communicable diseases, with cardiovascular disorders topping the list[2]. A sedentary lifestyle, stress, alcohol consumption, smoking, and an atherogenic diet are among the most prominent behavioral risk factors that can result in metabolic syndrome, diabetes mellitus, obesity, and ultimately cardiovascular illnesses.[3]

All of the aforementioned behavioral risk factors are present in medical education because of the demanding curriculum and lack of time for introspection. Numerous studies have demonstrated how common these variables are among aspiring physicians.[1,4-6] However, relatively few research has been conducted in Nepal, particularly in Pokhara. More understanding is required on medical students' awareness of these risk factors. In order to determine the prevalence of cardiovascular risk behaviors among students at a medical college in Pokhara, the following study was conducted.

Methods and Methodology

From July 21 to August 19 of 2024, a descriptive cross-sectional survey was conducted among first- and second-year medical students at Manipal College of Medical Sciences Pokhara. The study included all first- and second-year students who were available, willing to participate, provided informed consent, and free of known cardiovascular disorders.

The sample size was estimated utilizing the 11.5% prevalence of alcohol intake found in the study carried out in Pokhara municipal college students.[7] A sample size of 163 students was estimated to yield a prevalence estimate with a 5% error within 95% confidence levels. Just 165 of the total 200 students

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met the requirements and were included in the study. Ethical clearance was taken from institutional ethical board.

The data collection technique utilized was the Cardiovascular Risk Assessment Questionnaire, a standard set of questions that are accessible online and pertinent to the assessment of cardiovascular risk in adults.[8] The questions are numbered (scored) along each variable option. The likelihood of future cardiovascular events increases with increasing score. For every student, the total cardiovascular risk scores were estimated (table 1). It was first tested on 10% of the anticipated sample size before the study began, and those results were incorporated into the final analysis.

Risk scores between -88 and -100 are considered low risk, 101 to 220 are considered moderate risk, 221-350 are considered high risk, and 351 and higher are considered very high risk.

The first portion asked about their age, gender, education, and family history of cardiovascular diseases. Details about different types of homes, stress, intestinal toxins, lifestyle, inflammation and discomfort, and diet were also included. In addition to protective food consumption such as vegetables and fish, the data also included information on the consumption of fried foods, starchy foods, refined foods, sugary foods, sugar intake, coffee and soft drink consumption patterns, and the amount of water drunk daily. The second part of the questionnaire focused on the physical examinations.

Both alcohol intake and tobacco use were characterized by a history of either frequent or infrequent use. A family history of cardiovascular diseases was defined as a self-reported diagnosis of cardiovascular disorders in parents aged 60 years or younger (18). Urban and rural residences were defined in accordance with the Nepal census regulations.

Weight of the students was measured to the nearest 0.1 kg using a digital scale (brand SKU, brand number: 100584238_NP-1020970944), and the height was measured to the nearest 1 cm using a measuring tape (Komelon model: ergo 8m). It was requested to take off their shoes and stand with their heels touching. On top of the head, a flat wooden plank was positioned such that it was perpendicular to the measuring tape. The estimates from anthropometric measurements—height and weight—were used for the nutritional assessment. The BMI was classified as follows: underweight (< 18.0 kg/m2), normal (18.0–22.9 kg/m2), overweight (23.0–24.9 kg/m2), and obese (> 25 kg/m2).[9]

Waist circumference was also measured with the help of the same measuring tape. Students were asked to cover their midsections, revealing their belly buttons, while still maintaining their privacy. The measurement was taken halfway between the hip bone and the bottom of the ribs. Waist was loosely encircled so that one finger could fit inside the tape.

The students were instructed to take their blood pressure while sitting in a comfortable and relaxed position. An Omron digital blood pressure monitor (IL, USA) was used to take the measurements on the right arm of each student. Following the recommendations set forth by the European Society of Cardiology (ESC) in 2018, blood pressure was measured and classified, with hypertension being defined as systolic blood pressure (SBP) of 140 mm Hg and/or diastolic blood pressure (DBP) of 90 mm Hg.[10]

The statistical package for social sciences, or SPSS 17, was used to evaluate the data after it was initially entered into Microsoft Excel 2013 (SPSS for Windows, Version 17.0. Chicago, SPSS Inc). Where applicable, independent t-test and Anova with Tukey's correction were used to examine the relationship between the variables.

Result

There were 165 undergraduate medical students in total, including 89 men and 76 women. Out of 165, 52.7% were enrolled in junior classes. 76.4% of the students belonged to urban population. The mean age, BMI, neck circumference (NC), diastolic blood pressure (DBP), systolic blood pressure (SBD), and waist hip ratio (WHR) did not differ significantly between men and women. Table 1 provides an overview of baseline attributes. Of them, 4 (2.4%) were diabetics and 18 (10.9%) had hypertension. Three people (1.8%) reported using oral contraceptives in the past. Not a single student was married.

Table 1: Background characteristics of students

Variable	Male	Female	Total	Significance
Age	20.7±1.5	20.5±1.35	20.6±1.4	0.06
Junior	44 (50.6)	43 (49.4)	87 (52.7)	0.3
Senior	45 (57.7)	33 (42.3)	78 (43.7)	
Urban	67 (53.2)	59 (46.8)	126 (76.4)	0.7
Rural	22 (56.4)	17 (43.6)	39 (23.6)	
BMI	23.02±2.9	22.4±4.01	22.7±3.5	0.129
WHtR	0.9± 0.1	0.8±0.1	0.8±0.1	0.16
SBP	117±7.2	106±12.2	112.3± 74.3	0.07
DBP	76.9±6.5	71.3±8.6	74.3±8.07	0.06
Cardiovascular risk score	81±70.7	101.1±50.6	90.2± 62.9	0.1

BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure; WHtR, waist-hip ratio

*Test significant at $p < 0.05$. Continuous variables are expressed as mean± SD (corrected up to 1st decimal) and discrete variables are expressed as n (%)

Cardiovascular disease risk prevalence

The total cardiovascular(CVD)risk score for each student was used to estimate their cardiovascular riskfor diseases(table1). Over 30% of students fell into the moderate risk category (fig.1). Mean cardiovascular risk score was not found to be significantly different in men and women (table 2).However, the proportion of students with high (1%) and very high (2.4%) CVD risk was significantly higher in men (p=0.07) than in women (0%).The overall overweight/obesity rate was 43 %. In men it was 44.9% and in women it was 40.8%. Men consumed more alcohol than women did (6.1% vs. 2.4%, respectively), however the difference was not statistically significant (p=0.26). On the

other hand, males consumed tobacco at a much larger rate than females (12.8% and 1.8%, respectively) ($p < 0.001$).

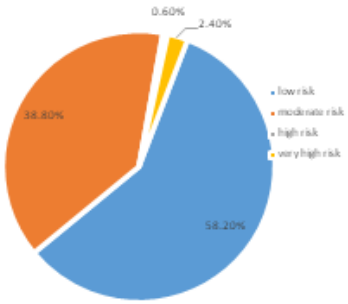

Fig: Total Cardiovascular Risk Ratio in the study population

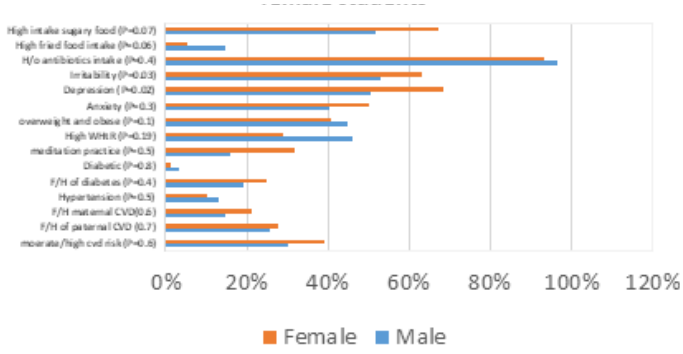

Fig 2: CVD risk factor prevalence among male and female students

Almost 30% of women and only 9% of men indicated low physical activity, whereas 10% of women and 19% of men reported high physical activity. Compared to only 15.7% of men, more than half (68.4%) of women reported regularly practicing meditation. Anxiety, depression, and irritability have been reported by both men and women at high frequency in the last six months prior to the study (40% vs. 50%, 50% vs. 68%, and 53% vs. 63%, respectively). Majority of men and women (90%vs96%) reported of sleeping 4-8 hours a day. Only a small percentage reported of sleeping more the 8 hours a day.Both men and women used antibiotics at extremely high rates in the year prior to the study (97% vs. 94%).

Nearly 40% of men and only about 5% of women reported of taking fried food every day. When asked if they consumed starchy foods such as bread, spaghetti, potatoes, and the like more than four times a day, just 11% of men and 9% of women said they did. On the other hand, 67% of women and approximately 52% of men said they regularly consume large amounts of sugary food. Less than 2% of women and 8% of men said they consumed more than six teaspoons of sugar per day.

More than 50% of men and the women said they did not usually eat fruit, while almost 90% of men and 80% of women reported consuming very little fish. In contrast, 75% of women and 50% of men said they ate one or two servings of vegetables per day. Taking one to two cups of coffee per day was reported by nearly 50% of men and 36% of women, while one to two liters of soft drink per week was reportedly consumed by 32% of men and 17% of women. 33% of males and nearly 53%of women said they drank more than 1.25 liters of water every day. The gender wise prevalence of CVD risk factors is outlined in Fig. 2.

In the multiple response analysis the clustering of the risk factors was seen across the cases. With the very high percent of cases reported taking fried food 84.8%, starchy food 77.6% and soft drink 68.5% in high amount. (Table 3)

Association and Correlation

Bivariate analysis showed factors like gender, family history of CVD and diabetes type II were statisticallyassociated (significant) with CVD risk score Table 3. Correlation coefficient for all the continuous variables (characteristics) in the study population are shown in Table 2. Out of ten characteristics, five of them (SBP, NC, weight, height and pulse) were negatively corrected with CVD risk score and none of the characteristics were found to be statistically correlated.

A one-way ANOVA revealed that there was a statistically significant difference in mean CVD risk score between more than two groups (F (2, 162) [F=44.45], p =0.00). Tukey's HSD Test for multiple comparisons found that the mean value of CVD risk score was significantly different between [who didn't feel anxious] and [who felt anxious weekly or more] (p = [0.00], 95% C.I. = [63.56, 114.6]). There was also statistically significant difference between [who felt anxious weekly or more] and [who felt anxious monthly or more] (p = [0.34], 95% C.I. = [1.84, 58.11]). In case of those [who felt depressed] from [who didn't feel depress] there was a statistically difference in mean CVD score between the groups (F (2,162) =34.2), p=0.00. Tukey's HSD Test for multiple comparisons found that the mean value of CVD risk score was significantly different between [who didn't feel depress] and [who felt depressed weekly or more] (p = [0.00], 95% C.I. = [54.56, 101.6]).

The mean CVD risk score also varied statistically significantly between at least two groups(F (2, 162) = [F=32.72], P = [0.00]). Games-Howell post-hoc test for multiple comparisons found that the mean value of CVD risk score was significantly different between [who were not easily angered] and [who were easily angered weekly or more] (p = [0.00], 95% C.I. = [45.88, 96.44]). There was no statistically significant difference between [who felt depressed weekly or more] and [who felt depressed monthly or more] ($p<0.05$). For those who exercised regularly from those who didn't exercise regularly were statistically significantly different with (F (4,160) = [F=9.45], P= [0.00]). Tukey's HSD Test for multiple comparisons found that the mean value of CVD risk score was significantly different between [who exercised less than once a week] and [who exercised for more than 3 times a week, 4-5 times a week and more than 5 times a week] (p = [0.00], 95% C.I. = [17.7,89.4;23.6,103.4;39.8,118.2 respectively]. (Table 4)

Table 2: Descriptive statistics and correlation coefficient for study variables

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1. SBP	112.3	11.4										
2. DBP	74.3	8.07	0.635**									
3. NC	34.0	4.34	0.279**	0.219**								
4. HC	90.8	13.5	-0.057	-0.07	.092							
5. WC	78.0	12.8	0.132	0.107	.289**	0.618**						
6. Weight	62.6	11.0	0.322**	0.277**	.425**	0.257**	.342**					
7. Height	165.0	12.3	0.290**	0.221**	.330**	0.057	.219**	.428**				
8. BMI	22.7	3.50	0.212**	0.220**	.255**	.206**	.248**	.771**	.025			
9. WHtR	0.86	0.12	0.224**	0.219**	.230**	-0.368**	.487**	0.136	.185*	0.085		
10. Pulse	79.2	9.53	-0.014	-0.049	-0.22**	-0.031	.007	-0.074	-0.2**	0.132	.052	
11. CVD risk score	90.2	62.9	-0.055	0.067	-0.048	0.005	.053	-0.002	-0.069	0.048	.062	-0.02

Correlation is significant at the 0.01 level (2-tailed).

Table 3: Association between various study characteristics and mean CVD Risk

Variables	N	Mean CVD risk score	Leven's test	t-test	p-value
Gender Male Female	 89 76	 83.0 101.6	 F=5.6 P=0.02	T=-2.01	0.04
Practice Meditation Yes No	 38 127	 106 87.2	 F=0.373 P=0.542	T=-1.67	0.96
Mother's CVD Yes No	 29 136	 122.2 85.5	 F=0.602 P=0.439	T=3.05	0.003
Father's CVD Yes No	 44 121	 106.5 86.1	 F=0.09 P=0.761	T=1.92	0.05
Parent with type II Diabetes Yes No	 37 128	 109.2 86.4	 F=0.501 P=0.48	T=2.027	P=0.04

Table 4: Association between various study characteristics and mean CVD Risk

Variables	N	Mean CVD risk score	Leven's test	Anova	P	Effect size η^2	Welch Anova	P
Feeling of anxiety No Weekly or more Monthly or more	 91 27 47	 60.16 149.25 119.27	 F=1.484 P=0.23	44.45	0.00	0.354		
Feeling of depression No Weekly or more Monthly or more	 68 45 52	 53.9 132.08 105.7	 F=0.245 P=0.78	F=34.2	0.00	0.297		
Easily angered (irritability) No Weekly or more Monthly or more	 70 50 45	 55.01 126.18 110.02	 F= 4.34 P=.015				F=32.72	0.00
Life style on exercise Less than once a week Average once/week Average2-3/week Average 4-5/week Average 5 or more/week	 31 32 44 28 30	 137.12 105.71 83.52 73.60 58.03	 F=0.154 P=0.961	F=9.4	0.000	0.191		

Discussion

The nine potentially modifiable risk factors for cardiovascular disease—diabetes, hypertension, smoking, lipids, obesity, food, physical activity, alcohol use, and psychosocial variables—and how they affect the disease's prognosis were determined by the Interheart and Interstroke studies.[11] The purpose of our study was to evaluate the risk factors for cardiovascular disease among undergraduate medical students from a tertiary center in Western Nepal.Being the first of its kind in this region of the nation, the study would help identify risk factors among medical students, which would benefit future doctors' quality of life. Table 5 compares the findings with other recent studies conducted on diverse populations in different parts of Nepal and India.

None of the students were completely free from risk of cardiovascular disease, particularly the nine modifiable risk factors mentioned above.Which were found to be important risk factors in Nepal too, as per the Interheart study.[11] And in 2007eventuallyidentified as major risk factors by thenationwide 2007 NCD Risk Factor Survey and other smaller studies.[12-15] Unlike in the Interheart and Interstroke studies lipid profiling was not done in this study. Instead we did inquire for food habits like excessive intake of fried foods, sugary food, starchy food and soft drinks. Which was present in high proportion in this study along with other factors fig 2, Table. This might have explained our very life style itself is taking toll in our cardiac health.

High cardiovascular risk ratio was found to be 3.0% in this study with well over 35.0% of students having moderate risk of CVD. Not comparable with the studies carried out in East India[1] and south India 6 with high CVD risk ratio of 14.3% and 16.0% respectively. In the study carried out in East India[1] the risk ratio of CVD was more in male, whereas in this study CVD risk score was more in Female table 2 though association was statistically not significant. The discrepancy might simply be the result from different sample size 433,which was rather high as compared to this study.However, with the comparable age group, in these studies, points to the fact that it exists in high proportion.

When at least three of the following five medical disorders are present together, it is known as metabolic syndrome: low serum levels of high-density lipoprotein, high blood pressure, high blood sugar, high serum triglycerides, and abdominal obesity. It is associated with risk of developing cardiovascular disease and type 2 diabetes in adults.[16] Lately it has been acknowledged to have a prevalence of 1 in 5 in the Nepali population.[17] Especially, obesity and hypertension are increasing. This study has found clustering of multiple CVD risk factors in the study population.

High systolic blood pressure and diastolic blood pressure were noted in 8.5% and 6.1% subjects respectively. The prevalence varied non-significantly by gender for both, however it was found to be higher in men. This discrepancy can be explained by men's higher rates of alcohol and tobacco use. The frequency of high blood pressure in the research conducted by Dhungana et al.[18] andKhanal et al.[19] was substantially greater, which is explained by the different demographic types used in the investigations. Comparable results was seen in the studies by Mukhopadhayet al.[1] Kurian et al. Ibrahim NK et al.[6] in contrast none of the student in the study by Dangol et al.4was hypertensive. On the other hand Ofori EK et al.[20] noted high systolic and high diastolic blood pressures in 45% and 32.5% of the students from Ghana. The similarities and differences in the prevalence can be attributed to the socio-cultural and genetic differences across the different populations.

38.2% of the students in this study had low physical activity.It has been found that higher the activity lower is the chance of cardio vascular diseases. Bearing similarities with the studies by Giri et al.5 (44%) and Rustagi et al.[21] (42.6%). Similarly another study by Paul B et al.[22] also reported high physical inactivity at 47.6%. with women being more physically inactive. Resembling similarity with our study. On the other hand, number of students performing low total physical activitywas lower in the study by Kurian S et al.[6] (13.0%), shrestha et al.[7] (17.7%), Dhungana et al.[18] (21.0%) and Khanal et al [19] (10.7%). Low physical activities has been reported in the universities students from others studies as well.Physical inactivity or sedentary life style recently is becoming a common phenomenonin academic discipline. Students' hectic academic schedules and general propensity for sedentary behavior and a tech-based lifestyle may be to blame for this.

The overall rate of overweight/obesity was very high (43%) and slightly higher in males in compare to females. Overall overweight/obesity ratewere prevalent in medical students in other studies across the world as well (25–38%). In addition to physical inactivity others factors like food habits and physiological factors and overall lifestyle might have impacted their health which contributes to the development of metabolic syndrome in the future.

Anxiety, depression, and irritability have been reported by both men and women at high frequency in the last six months prior to the study (40% vs. 50%, 50% vs. 68%, and 53% vs. 63%, respectively). Reflecting on the above findings, these physiological factors were significantly associated with mean CVD risk score. Joshi D et al [23] reported 23.93% having evidence of some psychological distress and 8.93% of respondents reported of having severe distress in the adult population in Kathmandu valley. The National Mental Health Survey also showed a similar life time prevalence of 10 % among adults in Nepal.[24] High perceived Stress Scale was also noted in 22.4% in the study by Mukhopadhay et al.[1] The study by Kunwar et al found stress to be present in 27% medical students and sadness or depression in 29.9% % and anxiety was at 41.1%.[25] Stress was detected in 22.5% of the Indian urban affluent adults aged 30–45 years in the study by Aeri et al.[26] In all these studies the level of metal problems in medical students were very high. It points to the fact that its impact on our overall health, including cardiovascular health, is increasing and if in time intervention is not implied it may result into heath crisis.

Family history of CVD were present in 26.7% of students.It was found to be statistically associated with mean CVD score. Comparable result was seen in the study by Dangol et al[4] and Mukopadhaya et al.[1] In the study by Shrestha et al it was

reported at 48.7% level.[7] Family history of CVD was present with variable proportions in many other studies. It points to the fact that it is increasing, but not only in the older population also in this age group. Timely intervention that too the preventive intervention may change the tide of looming disaster.

Limitations

Limitations of this study include a small sample size which cannot represent general population, and also which may not have reflected the true correlation and association between the variables, limited dietary questionnaire for understanding dietary habits, and no data on lipid profiles. Similarly, for the assessment of the impact of psychological state of the individuals on the risk of cardiovascular diseases no standard scales have been used, simply the yes/no questionnaire was used. The study was only limited to the 1st and 2nd year students, if only we could have manage to include the final year students, interns and post graduate students the horizon of the risk factors could have been more properly enumerated with high degree of accuracy.

Conclusion

The high prevalence of many modifiable risk factors for cardiovascular disease among the study participants is alarming and necessitates the introduction of screening programs, awareness campaigns, and monitoring initiatives. Medical education should not only be focusing on treating the diseases of the individuals but should also focus on preventing diseases like cardiovascular disease by educating the population on importance of changing their life style. The findings from the study and many other related studies points to the fact that, indeed, many of the risk factors are related to our habits. By modifying our habits, for that matter, our life styles would help us to achieve our goal that is to prevent it from happening.

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