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ORIGINAL PAPER

Gender Differences and Clustering of Modifiable Risk Factors of Non-communicable Diseases Among Medical Students: A Cross Sectional Study in Nepal

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Abstract The objective of the study was to explore gender differences in the risk factors of non-communicable diseases among medical students in Nepal. We randomly selected two private and one government medical college located in Kathmandu Valley. All the third year medical students (n = 191) from these selected colleges were requested to participate in an anonymous cross sectional survey. We gathered information about different risk factors for non-communicable diseases including smoking and drinking habits, physical activity and fruit and vegetable consumption. We identified significant gender differences in the clustering of modifiable risk factors among our study population (p value = 0.032). Logistic regression model showed that male and female medical students were significantly different in terms of smoking status [aOR = 4.12, 95 % confidence interval (CI) 1.57; 10.85] and high level of physical activity (aOR = 4.50, 95 % CI 1.80; 11.21). Male medical students should be targeted in future behavioral interventions for smoking cessation, while physical activity among female medical students needs to be promoted.

Keywords Cross sectional studies · Smoking · Physical activity · Medical students · Nepal

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Background

Non-communicable diseases (NCD) caused nearly 36 million deaths in 2008 [1]. This was about 63 % of the 57 million deaths that occurred globally in the same year. Cardiovascular diseases (48 %), cancers (21 %), chronic respiratory diseases (12 %) and diabetes (3.5 %) were the biggest contributors to these deaths. During the same year, they caused an estimated 7.9 million deaths in South-East Asia [2]. While the prevalence of NCD in general population is not known in Nepal, hospital based NCD prevalence was estimated to be 31 %, with chronic obstructive pulmonary disease, cardiovascular disease, diabetes mellitus and cancer being the most common [3].

The major NCDs share four behavioral risk factors: tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol. These risk factors have embedded socioeconomic determinants, and the greatest effects are seen in the low- and middle-income countries and on poorer people and disadvantaged groups within all countries [4]. In Nepalese society, gender is an important socioeconomic determinant. The effect of gender in the epidemiology of NCDs is pervasive, impacting not only the type of and exposure to different risk factors but also the actual and reported prevalence [5].

Previous studies have suggested a high prevalence of smoking, alcohol use, and other risk factors of NCDs among medical students of Nepal [6–8]. Being future

healthcare providers, it is important that medical students practice healthy behaviors as they often serve as role model for their patients. Moreover, having a high risk of NCDs will make them prone to a variety of diseases in the future which will impact their long term productivity.

In a patriarchal society such as Nepal, prominent gender differences in the prevalence of risk factors of NCDs can be expected. We aimed to identify if gender differences in risk factors of NCDs is present among the medical students of Nepal.

Methodology

Study Design and Setting

We conducted a cross sectional study among third year medical students in Kathmandu valley for 1 month in August 2013. Kathmandu valley which is inhabited by approximately 2.5 million people is comprised of three districts namely Kathmandu, Bhaktapur and Lalitpur; the greatest proportion of which lives in Kathmandu district; also the capital of Nepal [9, 10]. There are five medical colleges in the valley where [11], an approximately 650 medical students enroll each year.

Sampling Size and Sampling Techniques

We selected three medical colleges randomly through a list of five medical colleges. Doing so, we obtained two private and one government medical colleges in our sample. All the third year medical students (n = 191) from these selected colleges were enumerated in data collection. Assuming these three districts as a cluster, desired width of the 95 % confidence interval (CI) equals to 0.25, probability of having at least one risk factor 80 %, intra cluster correlation 0.01, and number of clusters 3, the calculated sample size in each cluster was 50, corresponding to a total sample size of 150. In addition considering 20 % non-response rate indicated 180 as total sample size.

Data Collection

We used modified version of WHO STEPS Instrument version 2.1 for data collection. This questionnaire has been previously used in Nepal [12, 13]. We used a written informed consent to be filled by the respondents prior to the questionnaire. The lead author visited medical colleges and carried out discussion with college authority for sampling frame generation. We selected fall the third year medical student attended at the day of data collection for study. Prior to administering the questionnaire, researcher explained in detail about the purpose of the study. The questionnaire was filled on the spot. To ensure the validity of the collected information, seating arrangement was done so that one student could not see the answer of another student.

Defining Variables

Regarding smoking, alcohol use and physical activity, standard guidelines for each level of risk factor was adopted from WHO NCD risk factor steps 1 and 2 questionnaires [14]. Ethnicity was defined as *Brahmin/Chhetri, Janajati, Madhesi*, others based on classification used in National Central Bureau of Statistics of Nepal [10].

We asked respondents on number of days and time spent on vigorous and/or moderate activities at work; travel to and from places, and recreational activities. We converted the responses to MET minutes/week. Vigorous activity, moderate activity and low physical activity was recorded based on the criteria given in the WHO steps manual [14].

Data Analysis

Data were entered in EpiData 3.1 and analyzed using Epi Info 3.5.4 following the WHO stepwise manual. Descriptive analysis was done and outcome variables were depicted in frequencies and percentages. The modifiable risk factors were analyzed by gender. The variables which had significant gender differences on bivariate analysis (i.e $p < 0.05$), were then selected for multivariate analysis using logistic regression.

Research Ethics

Ethical approval for this research was obtained from the Ethical Review Board of The Department of Community Medicine and Public Health, Institute of Medicine, Nepal. All the respondents were informed about the research objectives before administering the pretested study questionnaires. No personal identifiers were recorded. The researcher obtained approval from campus authority prior to data collection.

Results

Socio-demographic Characteristics of Respondents

A total of 191 medical students participated in the study, 62.3 % (n = 119) of which were male. The mean age of the respondents was 21.5 ± 1.0 (Table 1). A total of 61.8 % (n = 118) were Brahmin/Chhetri. The average age of starting alcohol consumption differed among male 18.38 (95 % CI: 17.84; 18.92) and female 17.58 (95 % CI: 16.25;

Table 1 Demographic characteristics of respondents

Variables	Frequency (n)	Percentage (%)
Study location		
Maharajgunj Medical Campus	58	30.4
KIST Medical College	55	28.8
Nepal Medical College	78	40.8
Sex		
Female	72	37.7
Male	119	62.3
Age		
20	25	13.1
21	70	36.6
22	69	36.1
23	24	12.6
25	3	1.6
Ethnicity		
Brahmin/Chhetri	118	61.8
Janajati	47	24.6
Madhesi	18	9.4
Other[a]	8	4.2

[a] Dasnami, Muslims, Dalits

18.91) students. On an average, men had 1.28 (95 % CI: 0.83; 1.73) standard drinks in past 30 days compared to 0.24 (95 % CI: 0.09; 0.39) among female. Men consumed 1.31 (95 % CI: 1.13; 1.50) slightly more servings of fruits in day compared to female 1.26 (95 % CI: 1.07; 1.46). Similarly, men consumed 2.10 (95 % CI: 1.96; 2.24) slightly servings of vegetables in a day compared to female 1.93 (95 % CI: 1.80; 2.06). We also calculated the total metabolic equivalent of task (MET) of male and female. The average MET minutes per week from all physical activity was 2,638.42 (95 % CI: 2,157.02; 3,119.82) compared to 1,470.56 (95 % CI: 1,060.27; 1,180.84) among female. The MET minutes from vigorous physical activity was 1,271.73 (95 % CI: 902.76; 1,640.70) among male compared to 278.89 (95 % CI: 25.52; 532.26) among female. Men had 1.34 (95 % CI: 1.19; 1.48) risk factors compared to 1.26 (95 % CI: 1.14; 1.39) among female (Table 2).

Table 3 Clustering of risk factors

Risk factors	Female	Male	Total
0	3 (21.43 %)	11 (78.57 %)	14 (7.3 %)
1	47 (40.87 %)	68 (59.13 %)	115 (60.2 %)
2	22 (42.31 %)	30 (57.69 %)	52 (27.2 %)
3	0 (0.0 %)	10 (100 %)	10 (5.2 %)
Total	72	119	191
	$p = 0.032$*		

* Significant at 95 % CI ($p < 0.05$)

Gender Differences in Clustering of Risk Factors

A significant gender difference in the clustering of risk factors was seen (p *value* $= 0.032$). A total of 11 male and 3 female had no risk factors. Similarly, 59.13 % (n = 68) of male and 40.87 % (n = 47) female had one risk factor, 57.69 %(n = 30) of male and 42.31 % (n = 22) of female

Table 2 Mean values of the variables

Variables	Mean total	95 % CI	Male	95 % CI	Female	95 % CI
Average age of the respondent	191 (21.54)	(21.41;21.68)	119 (21.81)	(21.63;21.99)	72 (21.11)	(20.93;21.29)
Average starting age of alcohol consumption	97 (18.12)	(17.57;18.68)	66 (18.38)	(17.84;18.92)	31 (17.58)	(16.25;18.91)
Average no. of occasions for alcoholic drinks in past 30 days	191 (0.88)	(0.59;1.18)	119 (1.28)	(0.83;1.73)	72 (0.24)	(0.09;0.39)
Average no. of servings of fruits consumed in 1 day	191 (1.29)	(1.16;1.43)	119 (1.31)	(1.13;1.50)	72 (1.26)	(1.07;1.46)
Average no. of servings of vegetables consumed in 1 day	191 (2.04)	(1.94;2.24)	119 (2.10)	(1.96;2.24)	72 (1.93)	(1.80;2.06)
Average MET minutes per week from total physical activity	191 (2,198.18)	(1,853.59;2,542.76)	119 (2,638.42)	(2,157.02;3,119.82)	72 (1,470.56)	(1,060.27;1,180.84)
Average MET minutes per week spent in vigorous activity	191 (897.47)	(640.84;1,154.09)	119 (1,271.73)	(902.76;1,640.70)	72 (278.89)	(25.52;532.26)
Average no. of risk factors in an individual	191 (1.31)	(1.21;1.41)	119 (1.34)	(1.19;1.48)	72 (1.26)	(1.14;1.39)

had two risk factors, 100 % (n = 10) male had 3 risk factors. Male and female significantly differed in terms of current smoking status ($p = 0.003$), alcohol consumed in last 30 days ($p = 0.002$) and categorization of physical activity ($p = 0.004$) (Table 3, 4).

Clustering of Risk Factors

We adjusted the variables for possible confounders, and final logistic model showed that, having a current smoking status (aOR 4.12, 1.57; 10.85) and high level of physical activity (aOR 4.50, 1.80; 11.21) remained statistically significant. While male were 1.31 times likely have moderate level of physical activity (aOR 1.32, 95 % CI 0.65–2.68), it remained statistically insignificant (Table 5).

Discussion

To the best of our knowledge, this is the first study exploring the gender specific clustering of risk factors of non-communicable disease among medical students in Nepal. Earlier studies among medical students were focused specifically on cardiovascular risk behaviors, substance use and alcohol use [6–8].

Gender specific analysis of health states and events is commonly reported in studies from developing countries. These studies suggest relative differences among men and women, so that possible interventions could be made from gender perspective. In our study, males were four times more likely to smoke than their female counterparts. Smoking is culturally more accepted for male than female. Traditionally smoking has been viewed as a masculine

Table 4 Risk factors by gender

Variables	Total	Male	Female	*p* value
Current smoker				0.003*
No	155 (81.2 %)	89 (74.8 %)	66 (91.7 %)	
Yes	36 (18.8 %)	30 (25.2 %)	6 (8.3 %)	
Alcohol consumed 30 days				0.002*
No	135 (70.7 %)	75 (63.0 %)	60 (83.3 %)	
Yes	56 (29.3 %)	44 (37.0 %)	12 (16.7 %)	
Respondent consuming <5 servings of fruits and vegetables				0.238
<5 servings	164 (85.9 %)	100 (84.0 %)	64 (88.9 %)	
>5 servings	27 (14.1 %)	19 (16.0 %)	8 (11.1 %)	
Categorization of physical activity				0.004*
Low	59 (30.9 %)	32 (26.9 %)	27 (37.5 %)	
Moderate	82 (42.9 %)	46 (38.7 %)	36 (50.0 %)	
High	50 (26.2 %)	41 (34.5 %)	9 (12.5 %)	

* Significant at 95 % CI ($p < 0.05$)

Table 5 Factors associated with presence of modifiable risk factors

Variables	Unadjusted odds ratio	95 % CI	Adjusted odds ratio	Exp(B)	95 % CI	
Current smoker	$p = 0.006$	Lower	Upper	$p = 0.004$	Lower	Upper
No	1.00			1.00		
Yes	3.71*	1.46	9.42	4.12*	1.57	10.85
Alcohol consumed in last 30 days	$p = 0.004$					
No	1.00					
Yes	2.93	1.42	6.04			
Consuming <5 vegetables and fruits serving in a week	$p = 0.353$					
Less than 5 serving	1					
More than 5 serving	1.52	0.63	3.68			
Categorization of Physical activity	$p = 0.006$			$p = 0.004$		
Low	1.000			1		
Moderate	1.08	.55	2.11	1.32	.65	2.68
High	3.84*	1.59	9.31	4.50*	1.80	11.21

* Significant at 95 % CI ($p < 0.05$)

character and medical students are no exceptions [15, 16]. Previous studies from Nepal have suggested have a high prevalence of smoking among males in comparison to female medical students [17–19]. Medical students who are role models for their patients, having smoking use means negative influence in their clients. Moreover this poses significant risk to their health.

Men and women differ significantly in their habit of physical activity. Men were four times more likely to perform physical activity compared to their counterparts. The low level of physical activity among female medical students has been reported from earlier studies [20–22]. Outdoor leisure and recreation activities, interest to watch television and movies and play computer games and video has risen considerably in recent years. This can be partly because of lack of safe outdoor playgrounds and walking tracks in many areas of the city. Also, limited awareness about benefits of physical activity and not giving it priority may be an additional reason. The reason could also be due to cultural reasons; females are generally not favored for going out of home and perform regular exercise/walking.

The tendency for preventable and modifiable behavioral risk factors to cluster has important implications for health-promotion and disease-prevention efforts. Higher prevalence of the coexistence of the risk factors for NCDs among male as compared to female was reported in an earlier study [23]. We found that significantly higher percentage of male had clustering of risk factors. A study from Pakistan reported over 80 % of respondents had clustering of risk factors, and more number of male had two or more number of risk factors. It has been shown clustering of two or more risk factors is usually associated with an increased risk of developing NCDs than can be expected on the basis of the sum of the separate effects [24].

Our study has a number of limitations. First we were not able to measure variables like obesity, waist circumference, hypertension and parental hypertension. Since we used self-administered questionnaires, we cannot exclude under or over reporting of some of the variables. We also acknowledge the limitation that survey responses do not always equate to actual personal practice of respondents. We included only the medical students of Kathmandu Valley due to logistic reasons; this might limit the generalizability of study findings. However, we have a number of methodological strengths; including the use of validated tools and inclusion of risk factors such as fruits and vegetables consumption and physical activity which will help to understand the epidemiology of modifiable risk factors among medical students in Nepal.

Significantly higher number of modifiable risk factors clustered in males, implies that male medical students should be targeted in future behavioral change interventions in medical schools. Physical activity among female medical students needs to be promoted which so far is neglected in Nepal. This study will add in developing primary prevention strategies with an integrated approach for addressing modifiable risk factors through improved accessibility to safe playing grounds, prohibition of smoking at public places in medical schools and increased access to behavior change messages. Including obesity, waist circumference, hypertension, and parental hypertension in the study design that covers representative number of medical schools in Nepal can be the future research priority in Nepal.

Conclusion

Significantly higher number of modifiable risk factors clustered in males. While male medical students should be targeted in future behavioral change interventions in terms of smoking and alcohol use, physical activity among female medical students needs to be promoted.

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Conflict of interest None.

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