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Risk-Factors Associated with Cardiovascular Health Status among in School Adolescents of Nepalgunj, Nepal

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Abstract

Background: *Social transitions involving economics and education that has witnessed the global transformation of rural to urban, not sparing Nepal, has resulted in altered population food habits and physical activities. Chronic illnesses are now emerging among adolescents. Risk factors for cardiovascular (CV) diseases can be effectively addressed in early adolescence to prevent por health outcomes. This study assessed the level of risk-factors associated with cardiovascular health status among in-school adolescents of Nepalgunj, Nepal and from the findings develop an intervention to improve CV-health related parameters to improve cardiovascular health outcomes.*

Methods: *This was a cross-sectional study conducted in Midwestern part of Nepal. Four institutions were selected consisting 2 privates and 2 public secondary schools using simple random sampling from total 7 schools in Nepalgunj municipality. Consenting students (178) from eight and ninth grades were enrolled. Data about demographic information, risk-factors for cardiovascular disease, and CV-health related parameters were collected using anthropometry and validated questionnaire. Data collected were analyzed as frequency distributions means and standard deviations with test of associations between variables at 5% level of significance.*

Results: *Prevalence of overweight was 10.67%, and alcoholism was 1.12%. Vegetarians were 4.49%. Active smokers were none. Passive smoking was 31% and no active smokers. Extremely sedentary lifestyle was found among 7.8%. Family history for hypertension and CVD present among 8.4% and 2.8% respectively.*

Conclusion: *Risk factors for CV illnesses were prevalent among the in-school adolescents who participated. Study suggests behavioural intervention to reduce risk factors and prevent poor CV health in adulthood.*

Keywords: *Cardiovascular disease, Overweight, Sedentary lifestyle*.

Introduction

Transitions in community social structures, economics, and education with resultant shift in rural community lifestyle to urban lifestyle characterized by congestions, sedentary lifestyle with unhealthy social and food practices, Nepal not being an exception. These changes resulted in altered way of food habits and physical activities. These added burden to low- and middle-income countries like Nepal (Wickrama, O'Neal, & Lott, 2012).

Chronic diseases, including cardiovascular diseases (CVD), cancer, chronic respiratory diseases and diabetes, account for 70% of all deaths worldwide. Of these, CVD remains the number one cause of death despite major improvements in its treatment. According to WHO, in 2012, 17.5 million people died of CVD and this figure is expected to grow to 23.6 million by 2030. (WHO, 2012). Obesity is one of the major growing problem among in-school adolescents in developed and developing countries.(Furer *et al*., 2020; Sigmund *et al*., 2020) Hypertension is also another emerging condition among adolescents that has been demonstrated to show positive correlation with obesity.(Mohan et al., 2019; Omisore, Omisore, Abioye-Kuteyi, Bello, & Olowookere, 2018).

The American Heart Association (AHA) released in 2010 a set of seven cardiovascular health components for youth and adults to describe ideal cardiovascular health.(Lloyd-Jones *et al.*, 2010) which describes an ideal cardiovascular health as absence of disease and favorable levels of health factors (total cholesterol, blood pressure, non-diabetic) and favorable health behaviors(nonsmoking, healthy weight, appropriate level of physical activity, healthy eating pattern).

Understanding risk factors involved in initiation of CVD is integral to the prevention of CVD-related morbidity and mortality. Preserving cardiovascular health through addressing modifiable risk factors is far more beneficial than treating advanced disease expecting benefits in long-term health of patients. Traditional non-modifiable risk factors for CVD such as age, sex, race, and family history of CVD can provide early basis for health promotion. Physiological, potentially modifiable risk factors include dyslipidemia, hypertension, diabetes, obesity, and smoking status. The effects of risk factors in adults are additive: the greater the number of high-risk factors present, the greater the risk of cardiovascular disease.(Washington, 1999).

The period of adolescence is the phase for rapid development of earliest structural lesions in the atherosclerotic process, severity of cardiovascular disease depends on coexisting major cardiovascular risk factors, and very few intervention studies have been conducted in this age group for CVD in adolescents in Nepal to validate the hypothesis. Adolescent age is initial age to develop food habits, become involved in smoking and alcohol intake. Results from previous studies reported varying prevalence of obesity and hypertension. (Armstrong, Cote, Devlin, & Harris, 2014; Ip *et al.*, 2016). Studies have established result of higher prevalence of hypertension among obese or overweight adolescents. (Mohan *et al.*, 2019; Pastucha *et al.*, 2010). Body mass index is one of strong predictor for adulthood metabolic syndrome So, we need to detect cardiovascular risk factors at early age and implement strategies to address CVD at this age to reduce the burden of CVD. To understand the status of adolescent CVH, we undertook to evaluate baseline CVH parameters of in-school adolescents from eight and ninth grades in urban municipality Nepalgunj a mid-western part of Nepal.

Materials and methods

Study design, subjects and settings

This study was a cross-sectional survey conducted to find out the nature of the cardiovascular health status of in-school adolescents in eight and ninth grades of Nepalgunj municipality, Nepal. Study location was purposively selected, while 50% of total schools in the location were selected by simple random sampling of 2 private and 2 public from 7 schools. Adolescents unwilling to participate, who could not perform exercises, have morbid conditions were excluded from the study. All the students (178) of grade 8 and 9 of 4 schools were included in the study after exclusions criteria had been implemented.

Data collection

A semi-structured questionnaire was used as research instrument to collect demographic information by interviewer-administered technique considering the participants were adolescents. Other anthropometric data such as cardiovascular health-related measures of Body Mass Index (BMI), resting heart rate, systolic and diastolic blood pressure were taken, family history of hypertension (blood pressure ≥140/90) and diabetes and Cardiovascular disease were noted for each participant. Instrument was pilot-tested, and reliability assured after identified revisions were made. Blood pressure was measured twice at interval of 10 minutes using mercury sphygmomanometer after 5 mins of rest in sitting position in both arms. The arm with highest reading was recorded. Resting heart rate was assessed using auscultation of heart.

Consent was sought and obtained one day before study from schoolteachers and parents of participants. Ethical approval was also received from all relevant research Ethics Boards.

Data analysis

Data was checked cleaned and edited in Microsoft excel 2010 then imported and analyzed using SPSS (Statistical package for social science, version 26.0 for mac) with descriptive statistics calculated for means and standard deviations for continuous variable and percentage and proportion for categorical variables. Data were presented in different tables under the title of

demography, CVD parameters and CVD risk factors.

Results

The results reported in this paper addressed the main objective of baseline assessment of cardiovascular health-related parameters. A total of 178 adolescents participated in the study.

Sociodemographic distribution of school going adolescents

Data showed that there were males (55.6%) and females (44.4%) who participated in the study and their mean age was for males 14.67±0.93 years and for female 14.53±0.88 years. Majority of participants were Hindu 92.69% followed by Islam and Buddhism. Total 36% belonged to lower ethnicity and 64% belonged to upper ethnicity group. *(See Table 1)*.

Cardiovascular health related parameters of adolescents

Baseline mean blood pressure level for Systolic Blood Pressure (SBP) was 99.31 and DBP was 65.17 mm of Hg. Means of BMI was 21.66 and resting heart rate of 74 beats per minute. Mean height was 148.5cm and weight was 47.7kg as shown in table 2.

Cardiovascular risk factors of adolescents

Results in this study showed that 1.68% reported active smokers while 31.0% were exposed to passive smoking. Prevalence of alcoholism was 1.12%. Majority (95%) were non-vegetarians and the rest (4.4%) were vegetarians. There were no cases of hypertension (0%).

Physical activity scores show 7.8% came under extremely sedentary category. Approximately 41% were active but sedentary,21% were slightly active and 30% were physically active. No obese child was found based on BMI scored, while 5% were underweight and 10.67% were overweight. (See Table 3).

Family history status of the adolescents showed that hypertension among family members was 6.41% of the participants followed by CVD (6.41%) and for Diabetes Mellitus (2.24%).

Table 1. Frequency distribution of Demographic Characteristics

Demographic Variables	Respondents in this Study N=178	
	Frequency (N)	**Percent (%)**
Gender		
• Males	99	55.6
• Females	79	44.4
Religion		
• Buddhism	6	3.4
• Hindu	165	92.7
• Islam	7	3.9
Ethnicity		
• Lower Ethnic Group	64	36
• Upper Ethnic Group	114	64

Discussion

This study sought to assess the level of risk-factors associated with cardiovascular health status among in-school adolescents of Nepalgunj, Nepal. It has been observed in recent times that exposure to cardiovascular risk factors in early age is increasing with alarming rate in developing country like Nepal. Certain enabling factors have been blamed for this observation, particularly in Nepal, such as lack of policy framework for health promotion, finance and infrastructure to overcome the burden of CVD. Risk of CVD is increasing in early age increasing.

Table 2. Cardiovascular Health-related parameters of participants in this study

Variables	**Respondents in this Study N=178**	
	$\overline{X}$	±SD
Weight (Kg)	48.53	4.7
Height (Cm)	148.63	5.06
BMI (Kg/m^2)	21.66	2.0
Systolic Blood Pressure	60.83	38.84
Diastolic Blood Pressure	82.06	18.05
Resting Heart Rate	73.18	5.56

**SBP: Systolic blood pressure, DBP: diastolic blood pressure, measured in mmHg*

Table 3. Cardiovascular risk factors among in-school adolescents

Cardiovascular risk factors	**Respondents in this Study N=178**	
	Frequency (N)	**Percent (%)**
Family Health History		
• Number with history of CVD	154	87.6
• History of CVD	5	6.41
• Hypertension	15	8.42
• History of Diabetes Mellitus	4	2.24
Smoking Habit		
• Active	3	1.68
• Passive	175	98.31
Alcohol Intake		
• Yes	2	1.12
• No	176	98.88
Physical Activity		
• Physically active	54	30.33
• Slightly active	38	21.34
• Active but sedentary	72	40.44
• Extremely sedentary	14	7.86
BMI (Kg/m^2)		
• Under weight (≤ 18.4)	9	5.05
• Normal weight (18.5 – 24.9)	150	84.26
• Overweight (25.0 – 29.9)	19	10.67
• Obese (≥ 30)	0	0.0
Hypertension		
• Yes	0	0.0
• No	178	100
Dietary Pattern		
• Vegetarian	8	4.49
• Non vegetarian	170	95.5

Known modifiable risk factors for CVD is one major area to implement health promotion interventions for preventive and promotive health action among this population to reduce early development of CVD. Assessing cardiovascular health status among adolescents is an important public health diagnostic strategy to detect changes as early as possible and constitute one of the easiest ways to prevent and control complications that may occur in later life, severity of disease and decrease mortality of CVD.

A study conducted in Banke, in a similar setting as our study reported demographic distribution just like this study (Paudel *et al.*, 2014). In our study, although no student was

reported of having hypertension, some studies have found almost 1% of in-school adolescents having hypertension.(Akther *et al.*, 2019) which could have differed by sample size. Substantial number of students were overweight and reported sedentary lifestyle which is supported by study conducted in Lalitpur district of Nepal which shows association between overweight or obese with sedentary behavior of adolescents (Karki, Shrestha, & Subedi, 2019; Witzel, Isensee, Suchert, Weisser, & Hanewinkel, 2016). Prevalence of smoking was minimal in this study (1.68 %) as compared with 6% shown by recent study done among secondary school going adolescents of Nepal. Likewise prevalence of alcoholism was 1.12% in this study whereas it is 5% in the other study of Nepal (Dhungana, Bista, Pandey, & de Courten, 2019). Study parameters to observe cardiovascular health are few in this study which is major limitation. Study setting was selected purposively, hence generalization is limited to similar adolescent population.

Conclusion

Sedentary lifestyle, overweight and passive smoking are highly prevalent among these in-school adolescents of this part of Nepal. Presence of these factors are important precursors cardiovascular disease in early age. It is important to eliminate these modifiable risk factors from these at-risk population of adolescents through well-tailored health promotion intervention. Family history of cardiovascular diseases in present study shows need to track these age group in future. This study strongly recommends a physical exercise programme to halt progression of unhealth body mass index, improved cardiovascular health-related parameter that would prevent development of CVD.

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