

Cardiovascular Risk Factors and Prediabetes Condition in Obese/Overweight Children in Selected School of Lalitpur District, Nepal

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ABSTRACT

Introduction: Obesity, hypertension and diabetes are the most powerful predictor of cardiovascular diseases in children as well as adults. These factors are interlinked to one another and form a vicious cycle. In Nepal obesity in children is not a priority search for a researcher owing to the overwhelming presence of undernutrition. The main aim of the study was to explore the cardiovascular risk factors among overweight and obese school children of the selected schools

Methods: We performed a cross-sectional descriptive study in a semi urban area private school in Lalitpur district, Nepal in 310 students of age group 14-16 years of 10th grade. The distribution of obesity by BMI and WC category was searched for. Capillary fasting glucose level was measured by glucometer and food habit and physical activities were inquired through structured questionnaire. Height and weight were measured by simple measuring tape and bathroom scale weighing machine. Blood pressure was measured by aneroid sphygmomanometer using standard technique. All the data were compared to the standards of south Indian study of children percentile chart.

Results: Obesity and overweight were found in 18.7 percent children. Pre-hypertension was found in 8.6 percent. Physical inactivity in terms of > 2 hours of TV watching, mobile and video game playing was found in 31.46 percent of obese children which was statistically significant (P<.001). However, there were no children found to be prediabetic.

Conclusions: There is increasing obesity among school going children in semi urban cluster of Kathmandu valley. The physical inactivity in the form of watching TV or playing video games/mobiles is associated with development of obesity. Hypertension is prevalent among obese children.

Keywords: cardiovascular; prediabetes; overweight; children.

INTRODUCTION

The majority of young people with obesity have been identified affected with Diabetes mellitus Type-II (T2DM). While blood pressure is the product of cardiac output and peripheral vascular resistance, either change in one variable causes fluctuation in BP measurement. If hypertension is the result of

any underlying disease process, it is referred to as secondary hypertension, whereas if no cause is identifiable it is referred to as primary (essential) hypertension. The most common associated factors for primary hypertension are heredity, diet, stress and obesity. In the recent years global epidemic of childhood obesity has raised the prevalence of hypertension in children.

The hidden cases having prediabetes condition in children have not been studied so far in Nepal. Thus, the objective of our study was to explore the cardiovascular risk

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factors among overweight and obese school children of the selected schools of Lalitpur district, Nepal.

METHODS

A cross sectional descriptive design was conducted among 310 students of class 10 who were included in initial screening for BMI measuring height and weight. Data collection was conducted during the first and second week of January 2015. Review of the class register performed and data was collected section wise. The study confirmed to the criteria set by the ethical review committee of the Institute of Medicine and the guidelines of the Nepal health Research Council. Ethical clearance letter was obtained from Nepal Health Research Council. Consents from parents of the selected students were obtained in written. Clearance letter for the study was obtained from the principal of the selected school. The respondents to the interviews were fully explained about the research. Verbal consent was obtained before the interview. Confidentiality of the respondents' personal information was assured.

The obese and overweight students were identified and measurement of fasting capillary blood glucose, waist circumference was taken. Blood pressure measurement and structured interviews were conducted using pretested questionnaire on physical activities and food habit in all participating students.

Study site

Graded English Medium School (GEMS) of Lalitpur district was selected as the site for the study. The school lies in suburb area of Lalitpur district.

Sampling technique and size

Sampling was done following census type. All the students of class 10 were involved in initial measurement of weight and height. The students with BMI >85th percentile for

the age and sex were selected for further measurement of fasting capillary blood glucose, and waist circumference. The students were then interviewed using structured questionnaire and blood pressure was taken from all participating students. .

- Inclusion criteria
 - After initial screening
 - a. Obese/overweight students (BMI calculated to be >85th percentile of the specific age and sex).
- Exclusion criteria
 - a. Students/ parents who deny the consent
 - b. Students who is suffering from chronic disease other than diabetes mellitus and hypertension
 - c. Students currently taking medicine for any disease for more than 7 days.

Data collection methods

The study followed the quantitative assessment of the height and weight. The weight measured using bathroom scale and is taken nearest to 0.1 kilogram. Height was measured with stadiometer and taken nearest to 0.5 centimeter. minimal clothing was allowed during the measurement.

Capillary blood was taken after overnight fasting following standard procedure. The capillary blood was tested by Biomed glucometer (made in Germany) with recommended numbered glucostrip by manufacturing company.

Blood pressure was taken by aneroid sphygmomanometer and stethoscope (manufactured by Doctor company-Japan) and taken nearest to 2 mm Hg reading. Proper explanation of the procedure with at least 5 minute rest was done for each student to allay the anxiety. The BP was measured in right hand with the hand hanging by side and rested at table. First and fifth korotkoff sound

were taken for SBP and DBP measurement.

Waist circumference was measured with simple measuring tape at the level midway between iliac crest and lowest palpable rib. Wherever it was not possible to palpate the lower rib, measurement was taken at the level of umbilicus.

Structured questionnaire was used for the interview of the selected students at school.

RESULTS

The normal weight according to BMI percentile came to be 81.29 percent. The overall percentage of overweight/obese is 18.7. The overweight and obese students are more in male category which came to be 24.1% within male while that of female category is less and is only 12.5%.

Table 1. Sex wise distribution of Normal, overweight and obese students

Sex	Normal	Overweight	Obese	Total
Male	126 (75.9%)	23 (13.9%)	17 (10.2%)	166 (100%)
Female	126 (87.5%)	11 (7.6%)	7 (4.9%)	144 (100%)
Total	252 (81.3 %)	34 (10.9%)	24 (7.7%)	310 (100%)

The table shows fasting capillary blood glucose levels in overweight and obese students. It seems that when the obesity is increasing the blood glucose level is also increasing.

Table 2. Distribution of capillary blood glucose level in overweight and obese students

Fasting Capillary Blood glucose level (mg/dL)	Overweight	Obese
71-75	6	0
76-80	3	2

81- 85	3	2
86- 90	2	1
91- 95	0	2
96-100	0	1
Total	14	8

The highest systolic BP was found to be 130 mmHg while that of diastolic BP was found to be 82 mmHg. Systolic pressure varies from 90 mmHg to 130 mmHg. Diastolic varies from 40 mmHg to 80 mmHg. When compared with the percentile chart according to height percentile, no child was found to be having high diastolic blood pressure.

Table 3. Relationship of blood pressure with overweight and obese

BP Systolic	Number	BP diastolic	Number
Normal	53 (91.4%)	Normal	58 (100%)
Pre hypertension	5 (8.6%)	Pre hypertension	0
Total	58		58

Table 4 depicts among normotensive children, 81.23 percent are normal, 10.36 percent are overweight and 6.80 percent are obese. In pre-hypertensive children, 0.65 percent are overweight and 0.97 percent are obese.

Among the overweight and obese children, the systolic pre-hypertension is observed more in obese category. (0.65% vs 0.97%).

Table 4. Systolic BP in relation with Overweight and obese

BP Systolic	Category of BMI			Total
	Normal	Overweight	Obese	
Normal	251 (81.23%)	32 (10.36%)	21 (6.80%)	304 (98.38%)
Pre hypertension	0	2 (0.65%)	3 (0.97%)	5 (1.62%)
Total	251	34	24	309 (100%)

Below table shows among students who watch TV and/or plays video/mobile games less than 2 hours, overweight is only 9.09 percent while that of obese is only 4.55 percent. However among the students with more than or equal to 2 hours, overweight and obesity both are increased to 15.73 percent.

Table 5. Daily TV/Mobile/Video game playing time and overweight and obesity

Time spent	Normal	Overweight	Obese	Total
less than 2 hrs	190 (86.36%)	20 (9.09%)	10 (4.55%)	220 (100%)
≥ 2 hrs	61 (68.54%)	14 (15.73%)	14 (15.73%)	89 (100%)
Total	251 (81.22%)	34 (11.01%)	24 (7.77%)	309 (100%)

The below table shows that the students who play less than 2 hours a day are more towards developing overweight and obesity. Among students who play less than 2 hours, 9.83 percent and 8.20 percent are overweight and obese respectively. While that of in equal to or more than 2 hours category, 13.49 and 6.34 percent are overweight and obese respectively. In latter category, obesity is less as compare to the earlier category.

Table 6. Obesity and overweight in relation to daily active play time

Active play time	Normal	Category of BMI		Total
		Overweight	Obese	
less than 2 hours	150 (81.97%)	18 (9.83%)	15 (8.20%)	183 (100%)
equal to or more than 2 hours	101 (80.15%)	17 (13.49%)	8 (6.34%)	126 (100%)
Total	251 (81.22%)	35 (11.32%)	23 (7.44%)	309 (100%)

DISCUSSION

A recent study done in private schools of Kathmandu valley in 4th-6th grade students

has found the prevalence of overweight/obesity of 25.9 percent.³ A study carried out in eastern part of Nepal among 7th, 8th and 9th grade students revealed obesity/overweight in only 8.21%. Both studies were based on BMI status.⁴ The WHO STEPS report 2007 in non-communicable disease survey also reported similar results in 15-24 age groups, where 27.1% were identified as overweight/obese.⁵ It also has expected that the rate of obesity is increasing more concentrated in urban cluster and in high socioeconomic status family. A large scale study done in school children of Shanghai, China of the age 7-20 years (average age 11.4 years) has found the prevalence of obesity in 22.6% using BMI criteria while 19.2% using WC criteria. There were more children in urban districts with OW/Ob status than those in rural districts (14.6% vs. 10.9% OW and 10.8 % vs. 7.4% Ob).⁶ The prevalence studied in fifth and sixth grade male students in urban schools of Saudi Arabia with the age range 10-14 years found to be 23.9 percent.⁷ Though the definition of OW and Ob varies according to the standards taken, there might not be much difference in overall prevalence as far as the percentile chart is used.

The physical inactivity in terms of less hours of active play and hours spent in inactive states such as watching television, playing video or mobile games is one of the cardiovascular risk factors and studied widely in several studies. In this study the physical inactiveness in reference to time spent in TV watching and video/mobile games was found to be more than 2 hours in 31.46 percent of OW and Ob children. While only 13.64 percent of children who spend less than 2 hours are OW and Ob. There is statistically significant relation of this physical inactive state and development of obesity and overweight (P value: 0.000). Study from eastern part of Nepal has observed 58.43% of students were experiencing physical inactive stage.⁴

Though the sample size for identification of the prediabetes condition in this study is less, it has revealed no association with the extent of obesity. Majority of students' parents and students themselves denied for taking blood sample in fasting state which brought the less number of sample for sugar level. But similar study in 12-19 year old adolescents in NHANES study in USA had found impaired fasting glucose in 7% children and among them 18% was obese. But similar study done in 12 middle school in USA showed 49% obese and among them 40.5% had IFG which has strongly condemned the obesity as independent risk factor for developing DM.^{8,9}

This study found the higher systolic BP which fell in pre-hypertension category in 8.62 % of the subjects among the OW and Ob children but the diastolic BP was normal in all individuals. The relation between high blood pressure and the OW/Ob was not statistically significant (P value: 0.331). However the other studies from neighboring countries like China, India have shown the increasing trend of high blood pressure in obese/overweight children. A large school based study in Shanghai, China in age group 7-20 yrs was done in 2009 and the results showed a positive correlation of BMI and WC with SBP and DBP. The risk of high BP prevalence was 1.5-2.2 folds in overweight and obese children than in normal weight children.⁶

CONCLUSIONS

It was found that among the various cardiovascular risk factors, childhood obesity is increasing in urban areas and in a clustered manner in Kathmandu valley. Elite schools where the students come from high socioeconomic status are more vulnerable to get this condition. Physical inactivity and Modern style food culture are seen to be the predisposing factors for the development of obesity. Systolic pre-hypertension is found in early ages among obese but prediabetes condition is not of much concern for those children. Increasing use of electronic

gadgets and TV watching may predispose children to obesity and development of other cardiovascular risk factors.

Since this study is a small unit study, results can't be representative for similar subset. Despite the limited nature of this study, it mandates large scale study to understand the current status of risk factors for cardiovascular diseases in childhood.

CONFLICT OF INTEREST: None

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