

Research Article

Consumption of Convenience Store Food and Obesity in Urban Preschool-going Children: A Cross-Sectional study in Nepal

Short Title: Obesity in urban preschool-going children

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Abstract

Background

Childhood obesity is a complex condition and the associated factors are not well understood. This paper aims to explore the relationship of behavioral factors including consumption of convenience stores food for lunch at school and obesity in urban preschool-going children.

Methodology and principal findings

A cross-sectional study was conducted among 351 randomly selected preschool-going children in Montessori-based schools in Kathmandu, Nepal. Parental socio-economic information, lifestyle, and behavioral information of children including lunch food source and physical activity was collected. The Body Mass Index (BMI) of the children was measured and the cut-off point of the World Health

Organization was used to categorize children into underweight, normal, overweight, and obese according to age and sex. Multinomial logistic regression analysis was conducted to assess the association. Odds of obesity increased for consumption of convenience store food for lunch [Adjusted Odds Ratio (OR) = 2.758, 95% CI=0.567-13.415] in comparison to home-cooked food. Odds also increased moderately for physical inactivity (AOR=1.951, 95% CI=0.199-19.152).

Conclusion

The findings suggest that consumption of convenience store food for lunch at school is associated with obesity in urban preschool-going children in Nepal. The findings can help to explain the information and knowledge gaps regarding obesity in preschool-going children in Nepal.

Key words: Public health; Obesity; Preschool child; Cross-sectional study; Determinants; Nepal

1. Introduction

Obesity among children has long-term effects on mortality and morbidity. Overweight and obese children are likely to maintain their status into adulthood and are at higher risks for developing cardiovascular diseases, stroke, hypertension, metabolic diseases such as type 2 diabetes, osteoarthritis, respiratory diseases, and certain cancers [1,2]. Although the health consequences of obesity are mostly manifested during adulthood, the factors underlying the disease conditions commonly originate during childhood [3]. Obesity in children has been associated with a wide range of factors including genetics, lifestyle, and behavioral factors such as diet patterns including fast food and takeaway meals, reduced or poor sleep quality,

sedentary lifestyle, reduced physical activity, and their interaction [4-8]. However, these factors overlap each other which makes childhood obesity a complex condition. Childhood obesity is a global health problem [9]. The highest prevalence rates of childhood obesity have been observed in developed countries; however, its prevalence is increasing in developing countries as well including Nepal, particularly in urban settings [10-12]. This might be due to rapid urbanization and economic transitions such as subsistence to market in Nepal. According to the national census, the urban population in Nepal increased to 17% of the total population in 2011 from 13.9% in 2001 [13]. Economic transition and rapid urbanization influence lifestyle and behavioral factors such as changes in dietary habits including takeaway meals or fast food [14].

Nepal has been facing challenges of under-nutrition among under-5 children for decades. The coexistence of under-nutrition and obesity among preschool-going children can give rise to the double burden of malnutrition in Nepal. However, research on obesity among preschool-going children in Nepal associated with lifestyle and behavioral related factors has so far been limited. This study aims to fill the information and knowledge gaps in this area.

2. Methods

2.1 Study setting and design

A cross-sectional study was carried out in Montessori-based schools in Kathmandu in Nepal. The data collection process was carried out from June 1st 2018 to January 31st 2019.

2.2 Participants and Sampling

Participants of the study were preschool-going children aged 3-5 years. The sample size was

determined by using a single population proportion formula with the following assumptions: level of significance (α)=5% (at a confidence level of 95%), marginal error $d=10\%$, and $p=50\%$ (as the prevalence of obesity among preschool going children in Nepal is unknown). The Z value is 1.96 (n = sample size, P = proportion, and d = marginal error)

$$n = z^2 * p * (1-p) / d^2 = 384$$

A simple random sampling technique was used to select the children following STROBE guidelines (<https://www.strobe-statement.org/index.php?id=available-checklists>). A total of 351 children participated in the study after obtaining consent.

2.3 Data collection

After getting permission from the school authority, structured questionnaires were distributed to a total of 351 children and respective mothers, with instructions about the questionnaire by the principal investigator. Each child's weight and height measurements were taken using a digital weighing machine and standard measuring tape respectively.

2.4 Variables

The questionnaire included demographic information including age and sex of the children, socioeconomic information including parental socio-economic status, lifestyle and behavioral information including the source of food for lunch at school, sedentary time, and physical activity. Anthropometric measurements including the height and weight of the children were measured with the consent of the parents. Body Mass Index (BMI) as weight in kg per square of height in meter was calculated. The World Health Organization (WHO) cut-off point according to age and sex was used to measure the underweight,

normal, overweight, and obesity [15,16]. BMI less than the 5th percentile were categorized as Underweight, 5th percentile to less than the 85th percentile as Healthy weight, 85th to less than the 95th percentile as overweight, equal to or greater than the 95th percentile as obese. The Source of lunch food was divided into three categories. Source of food for children who were carrying home cook food to school or mothers bringing home-cooked food during lunchtime at school was categorized as home-cooked food, children having school cafeteria food at lunch was categorized as school food, and source of food for children having convenience store food during lunch at school brought by mothers was categorized as convenience store food. Physical activity was divided into three groups and the sedentary time limit was divided into two groups according to the Physical Activity and Exercise Guidelines for all infants, toddlers, and preschoolers by the Ministry of Health of Australia [17]. Children in the last 7 days, who did 3 hours of various physical activities spread throughout the day each day at school and home, including energetic play such as running – playing tips, ball games or races at the park, kicking, throwing, and jumping – at the park or by creating fun obstacle courses at home, dancing, skipping were classified into group I. Children in the last 7 days, who did 3 hours of various physical activities spread throughout the day each day at school and home, including 60 minutes of energetic play such as running – playing tips, ball games or races at the park, kicking, throwing, and jumping – at the park or by creating fun obstacle courses at home, dancing, skipping were classified into group II. Children without any physical activities in the last 7 days were classified into group III. Sedentary time more than or equal to one hour a day was classified into group I, and less than 1 hour into group II. Data

were entered and analyzed in SPSS. Multinomial regression analysis was done to estimate risk after potential explanatory variables adjusted for each of the other. Healthy weight status was the reference group in the analysis.

2.5 Ethical consideration

The study was approved by the Research and Ethics Committee of the Asian University for Women and the study followed the Helsinki declaration. Consent of participants was obtained before the interview.

3. Result

Table 1 describes the characteristics of children attending preschool according to the lunch food source. A substantial difference was observed in the distribution of known or putative determinants. For example, 38% of the children from high income family were having convenience store food which was only 3.3% in the children from the low income families. Table 2 shows the prevalence of BMI status of preschool-going children according to the characteristics of the participants. The prevalence of

obesity varied according to all putative determinants. Prevalence of obesity was 34.2% in children having home-cooked food for lunch while it was 36.8% among children having convenience store food for lunch and 28.9% among children having school cafeteria food. A similar difference was observed for overweight. Table 3 shows multinomial regression analysis. Preschool-going children who were having convenience store food were found almost 3 times at risk of obesity in comparison to children having home-cooked food (OR=2.758, 95% CI=0.567-13.415). Among other lifestyle factors, children with no physical activity were found at risk in comparison to children with no activity (OR=1.951, 95% CI=0.199-19.152). Among the socioeconomic variables, children from high-income families were found at risk (OR=1.822, 95% CI=0.479-6.928) in comparison to low-income families. In terms of gender, odds increased for female children (OR=1.791, 95% CI=0.799-4.015) in comparison to male children. However, the risks were not significant statistically.

Characteristics	Source of lunch			
	Home food	School cafeteria	Convenience store	Total
Gender				
Female	95(57.2%)	30(46.9%)	44(36.4%)	169(48.1%)
Male	71(42.8%)	34(53.1%)	77(63.6%)	182(51.9%)
$X^2 = 10.843, df=2, p=0.002$				
Socioeconomic status				
Low	154(92.8%)	57(89.1%)	4(3.3%)	215(61.3%)
Middle	7(4.2%)	6(9.4%)	71(58.7%)	84(23.9%)
High	5(3.0%)	1(1.6%)	46(38.0%)	52(14.8%)
$X^2 = 262.165, df=4, p=0.000$				
Physical activity				
3 hours including 1-hour energy play	8(4.8%)	2(3.1%)	3(2.5%)	13(3.7%)
No activity	75(45.2%)	38(59.4%)	73(60.3%)	186(53.0%)
3 hours without 1-hour energy play	83(50.0%)	24(37.5%)	45(37.2%)	152(43.3%)

	$X^2=8.000,df=4,p=0.498$			
Sedentary time				
< 1 hours	83(50.0%)	26(40.6%)	46(38.0%)	155(44.2%)
>1 hours	83(50.0%)	38(59.4%)	75(62.0%)	196(55.8%)
	$X^2= 6.628,df=2, p=0.092$			

Table 1: Characteristics of urban preschool-going children according to the lunch food source (n=351).

Variable		BMI status				
		Underweight	Healthy	Overweight	Obese	Total
Gender	female	14(63.6%)	45(44.1%)	91(48.1%)	19(50.0%)	169(48.1%)
	Male	8(36.4%)	57(55.9%)	98(51.9%)	19(50.0%)	182(51.9%)
Socioeconomic status	low	20(90.9%)	76(74.5%)	100(52.9%)	19(50.0%)	215(61.3%)
	medium	0(0.0%)	15(14.7%)	55(29.1%)	14(36.8%)	84(23.9%)
	high	2(9.1%)	11(10.8%)	34(18.0%)	5(13.2%)	52(14.8%)
Lunch source	home food	18(81.8%)	61(59.8%)	74(39.2%)	13(34.2%)	166(47.3%)
	School cafeteria	2(9.1%)	19(18.6%)	32(16.9%)	11(28.9%)	64(18.2%)
	Convenience store	2(9.1%)	22(21.6%)	83(43.9%)	14(36.8%)	121(34.5%)
Physical activity	3 hours activity including 1-hour energy activity	1(4.5%)	4(3.9%)	7(3.7%)	1(2.6%)	13(3.7%)
	3 hours without 1-hour energy play	19(86.4%)	59(57.8%)	63(33.3%)	11(28.9%)	19(86.4%)
	No activity	2(9.1%)	39(38.2%)	119(63%)	26(68.4%)	2(9.1%)
Sedentary time	>1 hour	12(54.5%)	62(60.8%)	65(34.4%)	16(42.1%)	155(44.2%)
	<1 hour	10(45.5%)	40(39.2%)	124(65.6%)	22(57.9%)	196(55.8%)

Table 2: BMI status of preschool going children according to Lifestyle, behavioral and socioeconomic characteristics

Variables	Overweight		Obesity	
	Adjusted Odds Ratio	95% CI	Adjusted Odds Ratio	95% CI
Age	1.045	1.006-1.087	1.034	0.976-1.095
Gender				
Male	Reference	-	-	-
Female	1.696	0.978-2.940	1.791	0.799-4.015
Family socioeconomic status				
High	Reference	-	-	-
Middle	0.841	0.227-3.120	0.363	0.063-2.079
Low	1.112	0.429-2.882	1.822	0.479-6.928
Physical activity				
3 hours of physical activity with 1 hour of energy play	reference	-	-	-

No activity	1.381	0.222- 0.656	1.951	0.199- 19.152
3 hours of physical activity with no energy play	0.592	0.154 2.275	0.674	0.066- 6.838
Leisure sedentary time				
<1h/day	Reference	-	-	-
≥ 1h/day	0.378	0.219-0.653	0.618	0.275- 1.392
Lunch food				
Home	Reference	-	-	-
School cafeteria	0.383	0.116 -1.262	1.225	0.276 5.435
Convenience store	0.486	0.134 -1.760	2.758	0.567 13.415

Table 3: Logistic regression analysis of Overweight/Obesity in preschool-going children

4. Discussion

The school-based cross-sectional was conducted to assess prevalence and factors associated with obesity in preschool-going children. The outcome information of the study was defined by the WHO Body Mass Index cut-off points according to age and sex. The source population included the preschool children attending the school selected through simple random sampling. The study used anthropometric measurements to measure the weight and height of the children, and the school registry for age. Results of this cross-sectional study show variation in the prevalence of obesity according to behavioral factors including lunch food sources, physical activity, and sedentary time. Among the obese preschool children 34.2% were having home-cooked for lunch, 28.9% were having school cafeteria food for lunch, and 36.8% were consuming convenience store food for lunch. After adjusting the potential confounders, children having convenience store food were found almost 3 fold at risk of being obese compared to the children having home-cooked food [Adjusted Odds Ratio (OR) = 2.758, 95% CI=0.567-13.415]. The Association of obesity with consumption food purchased from convenience is consistent with previous literature [18,19]. Many unhealthy foods are

sold in convenience stores, such as sugar-sweetened beverages (SSB) and energy-dense snacks while limited healthy food is provided in convenience stores [20]. Parents buy unhealthy cheap food such as sugar-sweetened beverages and energy-dense snacks on the way to school due to poor socioeconomic status or lack of knowledge, increasing the intake of energy among children [21]. Energy intake that exceeds energy expenditure results in obesity among children. Majority of the obese preschool-going children (68.4%) were found without any physical activity in the last 7 days. The study explored preschool-going children who were not engaged in any physical activity are at risk of obesity in comparison to children with 3 hours of physical activity including 1 hour of energy play (Odds Ratio=1.951, 95% CI=0.199-19.152). Children who were not engaged in any physical activity are more likely to be overweight and obese than those who were engaged in physical activity, consistent with previous findings [22,23]. Physical activity increases total energy expenditure, which benefits staying in energy balance and lowers risks of overweight and obesity in children [24]. The study explored children who are from low socioeconomic status (SES) are at risk of being obese in comparison to children from

high socioeconomic status (SES) families (OR=1.822, 95% CI=0.479-6.928). This finding corroborates with the result of cross-sectional studies conducted before in the USA [25,26]. Families from low socioeconomic status (SES) are more likely to live in low SES communities. Low SES communities may have fewer physical activity facilities, particularly few free activity resources, than high SES communities, thus limiting access to opportunities for physical activity that can contribute to obesity in children. Many leisure activities may also be cost-prohibitive for low-income parents due to membership, participation, or equipment fees [27]. Furthermore, families with low income can't afford healthy food and tend to buy cheap junk food [28]. In the present study, girls were found at risk in comparison to boys (OR=1.961, 95% CI=0.510-7.543). In terms of sex differences, a study in India reported that boys are generally more likely to participate in physical activities than girls and at lower risk of obesity in comparison to girls. [29] However, in contrast to this study, a study in Vietnam among preschool-going children explored preschool-going boys are at risk of obesity in comparison to girls [30].

Limitation

The present study is subjected to some limitations. First, the survey was a cross-sectional study that did not define the causal relationship; second, the authenticity of lunch food source was not verified and the amount of calorie consumption was not measured; lastly, as the information is provided by mothers and was not monitored, there is a likelihood of recall bias. Studies with large sample sizes or longitudinal designs are needed to explore the causal relationship of overweight.

5. Conclusion

Current findings suggest that consumption of convenience store food for lunch at school is associated with obesity in urban preschool-going children in Nepal. The findings can help to explain the information and knowledge gaps regarding obesity in urban preschool-going children in Nepal.

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None

Conflict of interest

None

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