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Association of physical activity and feeding preferences of children with their nutritional status: A school based cross-sectional study

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Abstract

Background: People who are obese have a higher risk of acquiring many severe diseases. Feeding preferences and physical activities are deemed to play an important role in obesity in children.

Objectives: This study aimed to find out the prevalence of over nutrition among primary level children in selected private schools of Kathmandu Metropolitan City (KMC). It also assessed the impact of physical activity level and feeding preferences on their nutritional status.

Methods: An analytical cross-sectional study was done among 488 children and their parents, in six schools of KMC between May and August 2016. Children with written permission were included in the study, while absentees or hostel dwellers were excluded. Multistage cluster sampling was used for sampling. Ethical clearance was obtained from Institutional Review Committee of Kathmandu Medical College Public Limited and informed consent was taken from all participants. The questionnaire contained questions regarding socio-demographic details, modified Child's Feeding Questionnaire and Child Physical Activity Questionnaire. Data was entered and analysed using SPSS v.20.

Results: The prevalence of overweight was 4.5% (22) and obesity was 2.5% (12). Similarly, 135 (27.7%) children had adequate physical activity per day. Those with adequate physical activity were 1.5 times more likely to be overweight. Parent's perception of their child's weight and their concern about their child being overweight were both predictors of the child's actual weight.

Conclusion: Nutritional status of children was affected by feeding preferences of their parents, so they need to be educated about the importance of healthy eating and physical activities.

Key words: Body mass index; Child; Obesity; Overweight; Parents.

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INTRODUCTION

Malnutrition can be defined as a disorder that occurs due to imbalance of nutrients in the diet.[1] Overconsumption of nutrients can lead to overweight and obesity.[2] Prevalence of overweight and obesity has been increasing globally in the last few decades.[3] A World Health Organisation (WHO) report in 2016 showed that the prevalence of overweight people globally had increased to thrice its number since 1975.[4] With the rise in obesity worldwide, its prevalence among children has been increasing as well.[3] In 2019, it was estimated that about 38 million children aged less than five years were either overweight or obese.[4]

Obese people have higher risk of acquiring many severe diseases compared to those who have normal

weight.[5] Determinants like social and economic factors, environment, and education contribute to child being overweight and obese.[6] Similarly, eating habits and physical activities are also deemed to play important role in obesity in children.[6] There is scarcity of research on overnutrition and associated risk factors. This study aimed to find out the prevalence of overnutrition among primary level children in private schools of Kathmandu Metropolitan City (KMC). It also assessed the impact of physical activity level and feeding preferences of children on their nutritional status.

METHODOLOGY

An analytical cross-sectional study was conducted in six private schools of Kathmandu Metropolitan City (KMC), Kathmandu, Nepal. The study population included students enrolled in grades one to five and their parents. The data collection was done from May 2016 to August 2016. Children enrolled in the selected schools, who had written permission from their parents, were included in the study, while those who remained absent during the duration of the study or who were staying in hostel were excluded. The sample size calculation was done using the formula, sample size = z^2pq/e^2. Considering the value of p as 0.146,[7] design effect of two and a non-response rate of 25%, the final sample size was calculated as 480. Before starting the study, ethical clearance was obtained from Institutional Review Committee of Kathmandu Medical College Public Limited (Ref. 10012016). All the heads of selected schools, the selected children and their parents were informed in detail about the study. A written consent was taken from all the chosen respondents. The participation in the study was voluntary and the respondents could withdraw from the study at any time. The researcher maintained the confidentiality of all the respondents.

The study began with selection of schools and the students using a multistage cluster sampling strategy. In the first stage, a database of schools was obtained from District Education Office in Tahachal, Kathmandu with the name of the Resource Centres (RC) and the schools under each of the resource centres was used to create a sampling frame. The schools in the Kathmandu Metropolitan City are under 23 Resource Centres. Each centre has been allocated a certain number of schools that they are responsible for. As this study included only private schools, the sampling framework included only the private schools under the resource centres. From the sampling frame, three resource centres were selected by simple random sampling method (probability proportional to size). In the second stage, six schools were randomly selected by lottery method (two from each RC), with all schools in each resource centre considered eligible to participate. In the third stage, selection of one section from each of the grades from 1 to 5 was done by simple random sampling (lottery method). In the fourth stage, all students from the selected section were included in the study.

The parents who gave consent to participate in the research were given questionnaires (in Nepali) to fill. These questionnaires were self-administered by the parents at home and returned to the researcher in the next visit. The questionnaire assessed socio-demographic details, level of physical activity, and feeding preferences of parents for their children. Modified Child's Feeding Questionnaire (CFQ)[8] was used to collect information on feeding preferences of parents for their children and physical activity of the children was measured by using modified Child Physical Activity Questionnaire (CPAQ).[9] Additionally, height and weight of the children were measured in schools by the principal investigator.

Body mass index (BMI) of the children was the dependent variable while socio-demographic details, level of physical activity, and feeding preferences of parents for their children were the independent variables. The guideline from Centre for Disease Control and Prevention (CDC) was used to classify the nutritional status of the children,[10] WHO's guideline was used to classify physical activity. According to this recommendation, children's activity is divided into two categories, adequate and inadequate, based on a cut off for their average daily physical activities in minutes.[11]

The collected data was entered and analysed using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA). A level of significance was taken at 5%. First of all, BMI of children and physical activity level was calculated from the obtained data. Then, the variables were categorised into groups (for socio-demographic characters, physical activity and BMI); frequency and percent were calculated for all the variables. Pearson Chi-square test was used for bivariate analysis between the socio-demographic variables and independent variables. Crude odds ratio (COR) at 95% confidence interval (95% CI) was calculated to see the magnitude of association with independent variables. The CFQ contained 31 items which assessed different feeding preferences of parents for their children. The answers were in five point Likert scale with minimum score of one for the extreme negative choice and maximum five for farthest positive choice. Reverse coding was done for appropriate questions. Mean and standard deviation for each item were calculated separately and then the item

responses were summed to create a score for a group of items (subscale). There were altogether seven sub-scales in the questionnaire. Furthermore, Pearson correlation test was used to study the relationship between the sub-scales and BMI of children.

RESULTS

A total of 488 filled questionnaires were used for analysis, of which 304 (62.3%) were answered by the mothers and the remaining 184 (37.7%) were answered by the fathers.

Out of the total 488 children, 218 (44.7%) were boys and 270 (55.3%) were girls. The mean and standard deviation) age of the children was 8.1 ± 1.8years (Table 1). A quarter (125, 25.4%) of children belonged to grade five. The BMI of the children ranged from 11.3 to 32.5 kg/m^2, with mean and standard deviation of 15.38 ± 2.24 kg/m^2. More than two-thirds (334, 68.4%) children had normal weight. About a quarter (120, 24.6%) of them were underweight, while 22 (4.5%) were overweight and 12 (2.5%) were obese (Table 1). Out of the 488 children, 135 (27.7%) of the children had adequate physical activity per day (Table 1).

A Chi-squared test showed a directly proportional but non-statistically significant relationship between physical activity in children and being overweight. Those who had adequate physical activity were 1.5 times more likely to be overweight. But, this relationship was not statistically significant (Table 2).

Assessment of the Child's Feeding Questionnaire (CFQ), which was filled up by the parents is shown in table 3. In this study, the highest mean subscale score was for parental responsibility towards feeding their children (4.4) and the least for child's weight as perceived by parents (2.9) (Table 4).

The evaluation of the relationship between CFQ score and the BMI of the children showed that there was significant association between two of the subscales and BMI. Parent's perception of their child's weight was a predictor of the child's actual weight ($p < 0.001$). Similarly, the parent's concern about their child being overweight was also a predictor of the child's actual weight. ($p = 0.016$) (Table 4).

Table 1: Characteristics of children (N = 488)

Age (in years)	**Frequency (Percent)**
4-6	100 (20.5)
7-9	278 (57.0)
10-12	110 (22.5)
Total	488 (100.0)
Grade	**Frequency (Percent)**
1	91 (18.6)
2	88 (18.0)
3	75 (15.4)
4	110 (22.5)
5	124 (25.4)
Total	488 (100.0)
Nutritional status of children (according to BMI in percentile)	**Frequency (Percent)**
Underweight (<5th)	120 (24.6)
Normal weight (5-84.9th)	334 (68.4)
Overweight (85-94.5th)	22 (4.5)
Obese (>95th)	12 (2.5)
Total	488 (100.0)
Physical activity (min/day)	**Frequency (Percent)**
Adequate(>60)	135 (27.7)
Inadequate(<60)	353 (72.3)
Total	488 (100.0)

Table 2: Relationship between physical activity and body mass index of children (N = 488)

Physical activity (min/day)	Nutritional status according to BMI in percentile n (%)			
	BMI <85th Percentile	BMI ≥85th Percentile	Total	COR [95% CI]
Adequate (>60)	128 (94.8)	7 (5.2)	135 (100)	1.51 [0.64-3.56]
Inadequate (<60)	326 (92.4)	27 (7.6)	353 (100)	RC
p-value		0.34*		

*χ2 test, COR: Crude Odds Ratio RC: Reference category, CI: Confidence Interval

Table 3: Child feeding questionnaire (N = 488)

Parent's roles, perceptions, and concerns	Parents' response (in percent)				
Parent's role in their child's eating pattern.	**Never**	**Sometimes**	**Half of the time**	**Most of the time**	**Always**
Preparing their child's daily meal.	0.6	3.7	3.7	15.2	76.8
Their child's portion sizes.	0.4	4.5	7.2	18.4	69.5
Deciding if their child has eaten the right kind of foods.	4.7	7.2	8.6	19.0	60.5
Parent's perception of their own weight at different stages of life.	**Markedly underweight**	**Under weight**	**Normal**	**Over-weight**	**Markedly overweight**
Their weight during their adolescence	0.6	7.2	84.6	4.5	3.1
Their current weight	1.4	4.1	74.2	16.2	4.1
Parent's perception of their child's weight during different periods of time.	**Markedly underweight**	**Under weight**	**Normal**	**Over-weight**	**Markedly overweight**
Their child's birth weight	3.3	10.5	78.9	6.4	1.0
Their child's weight at 1 year	1.4	7.4	83.2	7.6	0.4
Their child's weight at start of school	1.8	8.0	80.9	8.2	1.0
Their child's current weight	1.4	13.1	77.7	4.9	2.9
Parent's concern about their child's eating habit.	**Not concerned**	**A little concerned**	**Concerned**	**Fairly concerned**	**Very concerned**
Their child eating too much when they are not around him/her	0.8	2.7	31.8	5.7	59.0
Their child becoming overweight	5.1	7.2	34.8	11.1	41.8
The extent to which parents should limit their child's access to foods.	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Make sure that their child does not eat too many sweets (candy, ice-cream, cake or pastries)	4.5	5.1	3.9	32.4	54.1
Make sure that their child does not eat too many fried foods (fried meat, fried vegetables, etc.)	3.3	7.4	6.6	48.8	34.0
Make sure that their child does not eat too much of his/her favorite foods.	11.1	19.7	10.5	38.9	19.9
Make sure that their child does not consume plenty of milk and milk products.	23.4	37.9	8.8	17.6	12.3
Make sure that their child does not eat plenty of fruits and vegetables.	42.0	34.6	3.5	8.8	11.1
Make sure that their child does not eat too much of snacks (potato chips, puffed foods, etc.)	5.5	9.2	7.2	35.0	42.8
Make sure that their child does not drink too many soft drinks (such as soda and sweetened beverage).	5.7	9.2	7.2	35.0	42.9
The extent to which parents usually limit their child's access to foods.	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Intentionally keep some foods out of their child's reach	10.0	7.6	7.0	35.5	40.0
Offer their child's favorite food to their child as a reward for good behavior	5.5	5.7	5.5	35.9	47.3

Guide or regulate their child's eating so that he/ she would not eat too many junk foods.	5.9	5.9	5.3	34.6	48.2
Guide or regulate their child's eating so that he/she would not eat too much of her favorite foods.	8.8	6.8	6.8	39.5	38.1
Parent's tendency to pressure their children to eat more food.	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
Their child should always eat all of the food on his/her plate.	6.4	18.9	7.2	34.4	33.2
They have to be especially careful to make sure their child eats enough.	2.9	4.3	4.9	34.6	53.3
If their child says "I am not hungry", they try to get him/ her to eat anyway	6.8	16.2	8.8	38.7	29.5
If I did not guide or regulate my child's eating, he/she would eat much less than she should.	6.8	15.8	5.0	38.9	33.4
Parent's attitude about discussing health and weight issues.	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I think that it is important to discuss healthy eating.	49.0	1.6	1.8	26.6	65.0
I think it is important to discuss weight related topics with my child.	3.7	7.8	5.7	35.2	47.5
Parents' parenting practices in monitoring feeding in children.	**Never**	**Rarely**	**Sometimes**	**Mostly**	**Always**
Keep track of the sweets (candy, ice cream, cake, pies, and pastries) that their child eats.	2.0	19.1	12.5	24.6	41.8
Keep track of the snack food (potato chips, instant noodles, cheese ball) that their child eats.	1.2	15.6	11.3	26.6	45.3
Keep track of the high fat foods that your child eats.	2.5	14.5	8.2	29.3	45.5

Table 4: Relationship between the dependent variable and CFQ subscale using Pearson co-relation coefficient

Subscale	Mean ± SD	R	p-value
Children's weight as perceived by parents	3.1 ± 0.5	0.2	<0.001†
Own weight as perceived by parents	2.9 ± 0.4	0.02	0.711
Concern about children being overweight	3.9 ± 0.9	0.11	0.016‡
Perceived responsibility	4.4 ± 0.6	0.06	0.162
Restriction to certain food by parents	3.9 ± 0.6	0.02	0.664
Pressure to eat by parents	3.8 ± 0.8	0.01	0.825
Monitoring of food by parents	3.9 ±1 .0	0.04	0.37

‡significant at p value <0.05; †significant at p value <0.001

DISCUSSION

This study aimed to find out the prevalence of over nutrition among primary level children in private schools of KMC. It also assessed the impact of physical activity level and feeding preferences of children on their nutritional status.

During the study the number of questionnaires distributed to the parents was intentionally kept more than the sample size for two reasons. Firstly, chances of non-response were high as the parental questionnaires were self-administered and the parents had to fill it at home and then return it. Secondly, the number of students per section varied in different schools. Out of the 570 questionnaires that were returned, 82 were discarded for being incomplete.

Nutritional status of children: This study showed that more than two thirds (334, 68.4%) of the children had normal weight. About a quarter (120, 24.6%) of them was underweight, while 22 (4.5%) were overweight and 12 (2.5%) were obese. In contrast, to these findings, a study

done among 986 children of grade one to six in private schools of Lalitpur, Nepal showed that higher proportion of children were overweight (144, 14.6%) and obese (111, 11.3%).[7] However, some studies have showed lower prevalence of obesity and overweight among children.[12-14] While a school based cross-sectional study done in Kaski, Nepal revealed that 49 (5.8%) participants were overweight and 19 (2.3%) were obese,[12] a similar study done among 1900 children in private and government schools of Biratnagar, Nepal illustrated that, overweight and obesity was found to be only 56 (2.9%) and 35 (1.8%) respectively.[14] While it is difficult to remark on the pattern of the prevalence of over nutrition, due to the studies being done in different age groups and varying sample sizes,[7,12,14,15] it is clear that over nutrition is an emerging public health concern in Nepal. A study done in Ethiopia also had finding that were contradictory to this present study.[16] It depicted that the percent of underweight (44, 9.5%) and overweight (46, 9.9%) was almost the same among school going children.[16] A similar study done among Amish children in USA showed that 10 (7.2%) were overweight, and 2 (1.4%) were obese.[17]

Physical activity of children: Only 135 (27.7%) of the children in this study had adequate physical activity per day while the rest (353, 72.3%) had inadequate physical activity. This is less than physical activity level of Indian children as demonstrated by a study in India which showed that about two-thirds of the children in private school had high physical activity.[18] Similarly a study done in schools of Rupandehi, Nepal showed that 239 (85%) males and 202 (56%) females had adequate physical activity based on WHO's standard for physical activity for 5–17 year old pupils.[19] In contrast, a study done in United Kingdom (UK) among 425 children reported that only 30 (7%) of them achieved adequate physical activity per day.[20] Unlike the aforementioned three studies (in Nepal and India) which used questionnaire to assess physical activity, this study (in the UK) used accelerometers to measure physical activity.[20] Thus the measurement is more likely to be accurate. Furthermore, this study showed a positive correlation between physical activity and BMI of the child. Surprisingly, those who had adequate physical activity were more likely to be overweight. This may be due to the fact that a questionnaire was used to assess the physical activity level and not a measurement device (for example: accelerometer). This can lead to overestimation or underestimation of the actual physical activity. Nonetheless, in contrast to this finding, a study done in about 400 eleven year olds showed that light physical activity was inversely associated with BMI of children.[21]

Feeding preferences of parents: Feeding preferences of parents was assessed using the answers to the CFQ. It showed that parents' perception of their child's current weight and parents' concern about their child being overweight were the only two predictors of the child's actual weight. In contrast, a Chinese study among school children reported that higher restriction and lower pressure to eat by parents were both related to higher BMI in children.[8] Another study done in Swedish children using CFQ showed that children's BMI was negatively associated with pressure to eat but positively associated with restriction.[22] In contrast, a research done among 232 school going children in Casablanca, Chile illustrated that there was no significant correlation between child-feeding practices and BMI z score.[23]

In spite of having a national action plan against NCDs, there is still little focus on prevention of over nutrition, especially among children. This study showed that parents have an impact on nutritional status of the children. Since children spend half of their time at school, the most feasible and effective approach to prevent over nutrition would be using preventive programs the help of parents and teachers at schools. This can be done by various activities like banning of junk food at school, compulsory physical activity during extracurricular activity class, including knowledge about healthy and unhealthy food in the curriculum of children. Also discussing about the importance of healthy diet and physical activities and its integration into daily life of children during Parents and Teachers Association (PTA) meetings can positively contribute towards healthy nutritional status of children. Additionally, national level prevention programs must also be designed which are aimed to reduce over nutrition and other forms of malnutrition. Monitoring and evaluation of such prevention programs must be done. Furthermore, it is recommended that a similar study but with a large sample including children and parents of public schools (government schools) be conducted.

This study had a few limitations. Firstly, as the data was collected from parents was through self-reported questionnaire, there is a probability that they may not have answered all the questions truthfully (Weight for example could have been under reported). Secondly, as this study assessed the nutritional status of primary level children only in private schools of Kathmandu Metropolitan City, the findings may not be generalised to the other settings or districts. Lastly, some parents of the chosen children did not give consent to participate in the study and some parents did not complete the

questionnaire, so were not included in the study. Similarly, some students remained absent during the study period. This may be a potential source of information bias as these participants may have different socio-demographic, lifestyle and nutritional status.

CONCLUSION

On account of this study, it can be concluded that there is a high prevalence of obesity/overweight among children aged 4-12 years and their nutritional status is affected by feeding preferences of their parents. Therefore, parents need to be educated about the importance of healthy eating habits and physical activities on the BMI of children and ultimately their health.

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