

Prevalence of Childhood Obesity in Dhaka City : Identifying Risk Factors

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Abstract: *The human race is facing a novel and enormous health challenge due to the rapidly unfolding global epidemic of obesity. Childhood obesity continues to increase significantly throughout the world with possible future consequences of developing insulin resistance, dyslipidemia, hypertension, metabolic syndrome, impaired glucose tolerance or Type 2 diabetes etc. To fight obesity, it is most important to identify the risk factors of childhood obesity. Therefore, it was planned to conduct this study, to explore the prevalence of childhood obesity in the studied population and to identify the risk factors contributing to the problem among these obese children that may help to design effective local prevention efforts and to develop recommendations for the prevention and management of obesity for a developing country like Bangladesh for a healthy tomorrow.*

Keywords: *childhood obesity, risk factors - dietary habits, physical activities and life style risk factors.*

INTRODUCTION:

The human race is facing a novel and enormous health challenge due to the rapidly unfolding global epidemic of obesity. The reasons behind this may include changes in the nature of our diet, transformation of agricultural production, the restructuring of the food supply and distribution mechanisms, urbanization and the development of sedentary modes of work and leisure. (James et al. 2006). Childhood obesity causes "bow-legged" children, pseudo tumor cerebri, asthma, obstructive sleep apnea syndrome, gallstones and fatty liver, insulin resistance, metabolic syndrome, hyperandrogenemia, impaired glucose tolerance, Type 2 diabetes, abnormal menstrual cycle, hirsutism, acne, acanthosis nigricans etc are frequently seen in obese children. (Must and Strauss, 1999). Socio-economic and socio-demographic risk-factors include family size, birth order, family income, family expenditure, care-giving etc. are responsible for the development of childhood obesity (Ravelli et al 1979). There is no study on analysis of risk factors for development of obesity in our population. Thus, this study was designed to focus on a selected population of school children to identify the prevalence of obesity among them and try to find out the presence of some selected risk factors for the development of

obesity. The identification of these risk factors is the key for prevention of childhood obesity. Therefore, this study was conducted to find out the prevalence of childhood obesity in the studied population and to identify the risk factors contributing to create this problem among these obese children and also help to design effective local prevention efforts and to develop recommendations for the prevention and management of childhood obesity for a developing country like Bangladesh for a healthy tomorrow.

METHODOLOGY:

Materials and Methods

A case-control study was conducted at eight (8) schools in Dhaka city in collaboration with the School of Public Health & Life Sciences, University of South Asia, Banani, Dhaka during the period of January, 2012 to December 31, 2012 (12 months).

Study population and Sampling technique:

All school going children aged 6-9 yrs in 8 purposively selected schools (equal no of Bengali-medium & English medium schools) of Dhaka city were selected. Written consent were obtained from school authorities initially and then from the students or their guardians to conduct the study. Height and weight of all children in this age group were measured. Thereafter, the BMI were calculated for age and sex of all students as per CDC growth chart. Children whose BMI for age were $\geq 95^{\text{th}}$ percentile of CDC growth chart were selected as obese. Finally, 24 obese students from each school were selected by lottery method from four age groups. From each age group equal no. of boys and girls were enrolled. Thereafter, for each obese child one non-obese age and sex matched child was also selected. In total, 384 students ($8 \times 24 = 192$ obese and 192 non-obese) were selected for the study purpose.

Data collection:

Data regarding different risk factors were collected from the participants using structured questionnaire by the researcher. The risk factors were classified into 3 groups - dietary habits, physical activities and life style risk factors. Information on socio-economic and socio-demographic status like position of the index case, family members, family structure, income level, expenditure on food and educational status of parents were also included in the questionnaire.

Data analysis plan:

Data were analyzed by computer based program SPSS 12.0 version. Confidence interval was set at 95% level. P value <0.05 was considered as significant. Chi-square test was done for making comparison between qualitative data. Odds ratios were calculated manually to see the associations between the childhood obesity and risk factors.

Ethics

The Ethical Committee of University of South Asia, approved the protocol. Informed written consent was taken from all the mothers/parents/guardians after full explanations of the nature and purpose of the procedure used for the study. Anonymity was maintained throughout the study, and none of the names were used in the database.

RESULT:

Total 4,527 students were screened (English medium school = 2183 and Bangla medium school = 2369), out of them 485 students were obese (10.7 %). The bivariate analysis among Bengali and English medium obese and non-obese children were found significant different ($p < 0.00001$).

Table 1: Distribution of obese child according to their medium of schools (4-9 yrs)

| | Bengali (%) | English (%) | Total (%) |
|-----------|-------------|-------------|------------|
| Obese | 198 (8.4) | 287(13.2) | 485 (10.7) |
| Non-obese | 2171 | 1896 | 4067 |
| Total | 2369 | 2183 | 4552 |

df=1, Chi-square (χ^2) Test; p value < 0.00001 .

No significant differences were found between the number of issue of a family, family structure, birth order, father's and mother's educational level, father's and mother's occupation with childhood obesity. Family income per month and expenditure of money on food per month were significantly related with the development of childhood obesity ($P < 0.00001$). Majority of the mother of both groups were the main care giver and no added risk was detected in relation to care giver or working mother.

Table 2 : Distribution of monthly family income & expenditure on food of cases and controls:

| Monthly family income (Tk.) | Cases (n= 192) | Controls (n=192) 0 | p-value |
|--|----------------|--------------------|-------------|
| $\geq 25,001-50,000$ | 4 | 41 | |
| 50,001-80,000 | 56 | 122 | < 0.00001 |
| 80,001 and above | 132 | 29 | < 0.00001 |
| Monthly family expenditure on food (Tk.) | Cases (n= 192) | Controls (n= 192) | p-value |
| 15,001-30000 | 3 | 40 | |
| 30,001-50,000 | 81 | 120 | < 0.009 |
| 50,001 and above | 108 | 32 | < 0.00001 |

Physical inactivity like watching TV, Video game and computer watching and also the availability of playing ground at school and at or near home were significantly ($P < 0.00001$) related with the development of childhood obesity. Watching some socio-demographic risk factors were analyzed. Family income $>80,000/-$ per month and spending money $>50,000/-$ per month on food were associated with the development of childhood obesity with Odds Ratio of 12.36 and 6.42 respectively.

TV watching for more than 4 hrs and time spend for Video game or computer for more than were found to be risk in development of obesity with the OR of 6.1 and 4.96 respectively. Physical activity more than 2 hrs, presence of play ground at or near home and school were negatively related to the development of childhood obesity with OR of .2, 0.09 and .75 respectively.

Table 3 : Socio –demographic risk factors for development of childhood obesity

| Socio –demographic Risk-factors | Case(192) (n=96) | Control(192) (n=96) | Odds ratio |
|--------------------------------------|---------------------|------------------------|------------|
| Family income $>50,000$ /- taka | 132 | 29 | 12.36 |
| Expenditure on food $>30,000/-$ taka | 108 | 32 | 6.42 |

Table 4: Activity-related risk factors for development of obesity in studied children.

| Activity related risk factors | Case (n=192) | Control (n=192) | Odds Ratio |
|---|--------------|-----------------|------------|
| Watching TV < 4 hrs | 94 | 164 | .09 |
| Watching TV 4-8 hrs | 98 | 28 | 6.1 |
| Watching Videogame and computer < 2 hrs | 45 | 58 | .70 |
| Watching Videogame and computer 2-4 hrs | 84 | 26 | 4.96 |
| Physical activity < 2 hr | 145 | 60 | 6.78 |
| Physical activity $\geq 2-4$ hr | 52 | 125 | 0.2 |
| Relationship with Play ground at or near home | 55 | 135 | .09 |
| Relationship with Play ground at School | 135 | 145 | .75 |

Dietary risk factors were analyzed for the development of childhood obesity considering the amount of diet and the frequency of intake of foods were analyzed. Multiple food habits were considered like amount of rice, no. of bread, the method of egg preparation (boiled/ fried), no. of egg intake daily/weekly, vegetables, fish, mutton, chicken and chicken roast and some fast food items etc to see whether these items were responsible

for the development of childhood obesity. Taking more rice (>2.5 plate), preparation of egg (boiled/ fried), increased frequency of taking egg were found to be risk factors for the development of obesity with ORs of 2.04, 2.01 and 4.8 respectively. Excess intake of mutton and chicken (three times /weekly) and noodles (daily) were found to be risk for the development of childhood obesity with odds ratios were 3.2, 2.37 and 4.9 respectively. Odds ratios were not significant in case of fruits (OR 0.95) and vegetables (OR 0.58). Intake of fish (three times /weekly) was found healthy for the children and odds ratio was 1.2 and daily intake was found to be negatively related with the development of childhood obesity with OR of 0.56, but on the contrary if the intake decreased to once weekly, the chance of development of obesity was more (3.19). The intake of fast foods like chips (OR 6.44), burger (OR 7.1), pizza (OR 6.5), chicken roast (OR 5.5), ice cream (OR 4.3) were significantly working as risk factors in the development of childhood obesity.

Table 5: Dietary habit - related risk factors for development of childhood obesity

| Risk factors | | Case (192) | Control (192) | Odds Ratio |
|--|--------------------|---------------|------------------|---------------|
| Considering the amount of rice | Two and half plate | 130 | 58 | 2.04 |
| Considering the preparation of egg | Omlet/Fried egg | 140 | 110 | 2.01 |
| Considering frequency of taking egg only | Once daily | 130 | 58 | 4.8 |
| | 3 times weekly | 62 | 76 | 0.72 |
| Relationship with vegetables intake | Once daily | 40 | 60 | 0.58 |
| | 3 times weekly | 96 | 96 | 1 |
| Relationship with fruit intake | 3 times weekly | 115 | 120 | 0.95 |
| | 5 times weekly | 45 | 90 | 0.27 |
| Considering frequency of taking mutton | 3 times weekly | 120 | 60 | 3.2 |
| | Once weekly | 54 | 65 | 0.73 |
| Considering frequency of taking Chicken only | 3 times weekly | 130 | 95 | 2.37 |
| | Once weekly | 44 | 130 | .16 |
| Considering frequency of taking noodles | Once daily | 72 | 21 | 4.9 |
| | 3 times weekly | 102 | 75 | 1.7 |
| Considering frequency of taking fish only | Once daily | 88 | 115 | .56 |
| | 3 times weekly | 52 | 45 | 1.2 |
| | Once weekly | 52 | 20 | 3.19 |
| Considering frequency of taking Chips only | Once daily | 92 | 24 | 6.44 |
| | 3 times weekly | 80 | 84 | .91 |
| Considering frequency of taking Burger only | 3 times weekly | 92 | 22 | 7.1 |
| | Once weekly | 52 | 30 | 2.05 |
| Considering frequency of taking Pizza only | Once weekly | 18 | 3 | 6.5 |
| | Once fortnightly | 39 | 8 | 5.86 |
| Considering frequency of taking chicken roast only | 3 times weekly | 45 | 10 | 5.5 |
| | Once weekly | 64 | 35 | 2.16 |
| Considering frequency of taking ice cream only | 3times weekly | 27 | 7 | 4.3 |
| | Once weekly | 55 | 40 | 1.5 |

Discussion:

This study was conducted in 8 schools of Dhaka city among 6-9 years of age group of children and the schools were purposively selected. The prevalence of obesity was found

10.7%. Obesity was found more among the English medium school boys of 8-9 yrs of age group. Some studies were done in India, Umesh et al. (2002) and Kaushik et al. (2007) showed that obesity was found 6%-8% and 5.10% respectively in Kolkata, but Anoop Misra et al. (2008) showed in his study that in urban area in New Delhi obesity was increasing from 16% in 2002 to 24% in 2006-2007. There was a study which was done in Dhaka city in 2000-2001 by Rahman et al. where obesity was found 7.6%. Our study is showing the increasing trend of childhood obesity in Dhaka city but did not matched with any of the Indian studies because of the socio-cultural status, economical status and geographical variations etc as well as year of study time.

A study was conducted by Rahman et al. in 2000-2001 in Dhaka city where childhood obesity was found 7.6% among the studied population which became one and half time more in our study in last one decade which matched with the findings in developed country like USA and Australia. The prevalence of obesity quadrupled over 25 years among the children of USA (Ogden et al. 2002) and in Australia, obesity was increased by 4.6 fold among girls and 3.4 folds among boys (Magarey, 2001).

Socio-demographic risk factors like family size, family structure, birth order, care giver, family income and expenditure on food etc were analyzed. Wilkinson et al. 1997 showed in his study that the prevalence of obesity was high among the nuclear family and in single children family and the prevalence declined with increasing the size of the family but our study failed to show any significant association with childhood obesity. This study was done in urban area and where the family size was usually small with only one or two children and also the unavailability of joint family in urban area showed no significant associations with childhood obesity which was consistent with that of Revali et al. study (1979).

This study was performed only in urban area with majority of the parents were literate and educated, so, their educational status had no significant association with the development of childhood obesity. So, it was not possible to see the association of childhood obesity with uneducated parents.

Socio-demographic risk factors like family income and family expenditure on food were analyzed to see the association with childhood obesity. World Health Organization (1998) considered income, expenditure, education, occupation and place of residence (urban/rural) to evaluate socio-economic status in relation to obesity. Our study showed that 68.75% of children were from high income family in obese group. High family income (>80,001/-per month) with OR of 12.36 and spending on foods (50,001/- per month) with OR of 6.02 were associated with the risk of development of childhood obesity.

Children's daily life is full of activities and movements, for example, walking, sports, gardening, running or jogging, household chores, active games and play, and stretching. But due to urbanization, life style modification and digitalization of world, most of the children are becoming habituated to sedentary behavior like watching TV and Videos and using computers etc. Absence of these daily activities they are becoming obese. Also due to lack of playing and outdoor games facilities, children are habituated to sedentary activities and become obese. We observed in our study that in most of the schools had small playing ground and in some schools there was no playing ground and interestingly children were not allowed to play in these playing ground except weekly for 30-45 minutes. No significant association was found between schools having play ground and childhood obesity. On the contrary, who had play ground at or near home, were less prone to develop obesity. Timperio et al. (2004) showed in his study that without safe places near home might keep their children almost inactive with indoor games and allow them to develop sedentary behaviors and to acquire childhood obesity which matched with our study report.

TV watching (4-8 hrs) and computer game (2-4 hrs) playing showed significant association ($p=0.00001$) with the development of childhood obesity. The result of our study matched with a cross-sectional study done by Mendoza et al. (2007) in which we found that watching TV / Video > 2 hours /day was associated with a high risk of being overweight or at risk for overweight and higher adiposity. Though the study was done in urban area and most of the children (53.6%) had no access to computer game. Total no. of children who were engaged in playing computer game < 2 hrs in a day was forty nine (49), of them, twenty two (22) were obese and twenty seven (27) were non-obese. No significant association ($< .44$) was found in the development of childhood obesity. Robinson et al. (1999) showed in his study that the effect of reducing TV/Video watching and Video game use on changes in adiposity, physical activities and dietary intake and also revealed that reducing these activities help to prevent childhood obesity.

We studied dietary habit related risk factors for the development of childhood obesity. The intake of amount of rice and also the method preparation of eggs and also the frequency of taking egg daily or weekly taken into account, taking more rice (> 2.5 plate) daily and having egg daily were found as risk factors for development of childhood obesity with higher odds ratios. Excess intake of mutton and chicken (three times /weekly) and noodles (daily) were found to be risk for the development of childhood obesity with odds ratios were 3.2, 2.37 and 4.9 respectively. Odds ratios were not significant in case of fruits (OR 0.95) and vegetables (OR 0.58). Intake of fish (three times/weekly) was found healthy for the children and odds ratio was 1.2 and daily intake was found to be negatively related with the development of childhood obesity with OR of 0.56, but on the contrary if the intake decreased to once weekly, the chance of development of obesity was more (3.19). The intake of fast foods like chips (OR 6.44),

burger (OR 7.1), pizza (OR 6.5), chicken roast (OR 5.5), ice cream (OR 4.3) were significantly working as risk factors in the development of childhood obesity.

The study showed the prevalence of childhood obesity was 10.7 % amongst 6-9 yrs of age children in the studied population which clearly indicating that the childhood obesity is an emergency health problem among the school going children in Dhaka city. Multiple risks factors as for example, family income, family expenditure on food, dietary habits, sedentary behaviors and physical activities were identified for the development of childhood obesity in the study. Further study needs to confirm these findings which are responsible for the development of childhood obesity in Dhaka city as well as for all the children of the country.

CONCLUSION:

The study findings showed that the prevalence of childhood obesity in the mentioned age group was 10.7 % in Dhaka city indicating that the childhood obesity is an emerging health problem of school going students of Dhaka city.

Multiple risk factors like family income, family expenditure on food, dietary habits, watching TV, watching video and computer game and physical activities were identified in this study, further study is needed to confirm the finding in Dhaka city as well as for all children of the country.

LIMITATION:

The limitations of the study were the followings

- study was limited to Dhaka city only among the nearly similar socio-economic background
- the sample size was quite inadequate to represent this emerging health problem
- And the schools were selected purposively.

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Author's Biography



Dr. Md. Aynul Islam Khan is a Clinician (Pediatrician) as well as a Researcher. Dr. Khan is a medical graduate with Diploma in Child Health, MD and MPH degree. He is now working as Junior Consultant (Paediatrics), UHC, Singair, Manikgonj and also works as an honorary pediatric consultant of Child Sight Foundation (CSF). He has taken active participation of several researches on childhood disabilities in CSF in collaboration with CBM, ICED of London School of Hygiene and Tropical Medicine (LSHTM). He has a number of international publications.



Prof. Dr. Muhit has 15 years experience in health and disability sector in Bangladesh and globally. He has also 15 years teaching experience in London University and University of South Asia, Bangladesh. Prof. Muhit has taught on international eye health and disability courses in Netherlands, Germany, UK, USA, Australia and India. He is also visiting faculty of University of London. Currently he is developing his research interest into more broadly on disabilities in children.

Prof. Muhit awarded by APAO (Distinguished Service Award 2007), OSB (M. A. Matin Gold Medal 2008) and Australian Government (Australian Leadership Fellowship Award 2013).

Prof. Muhit was Medical Advisor to Muslim Aid UK and in the recent past he has been consulted by CBM International, Sight Savers International and The Fred Hollows Foundation. Prof. Muhit was involved as a consultant in developing the largest Paediatric Cataract Program with Sight Savers and ORBIS International to identify and treat over 10,000 cataract blind children in Bangladesh, which completed successfully in 2010. This Childhood Cataract control program was designed and developed by using the epidemiological data from Prof. Muhit's study and his innovative Key Informant method to identify and deliver services to blind children from rural areas of developing countries in south Asia and sub-Saharan Africa.