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Research Article

Socioeconomic Variables Associated with Level of Obesity and Prevalence of Other Diseases Among Children and Adolescents of Some Affluent Families of Bangladesh

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Abstract

The present study utilized the data collected from 662 children observed from 560 randomly selected families of students of American International University-Bangladesh. Among the investigated children and adolescents 465 were in underweight group. Obesity and severe obesity were observed among 9.1 percent children and adolescents and prevalence of diabetes was observed among 22.8 percent respondents. The percentage of respondents affected by different diseases except diabetes was 13.4. It was evident that level of obesity, prevalence of diabetes and prevalence of other diseases were significantly associated, and level of obesity was associated with different socioeconomic characters of the parents and of the respondents. Parents' education, age of children, family income and food habit of the children were the most important variables for the change in level of obesity of children and adolescents. Fitting of logistic regression using level of other diseases as dependent variable showed that residence, parents' education, family income, prevalence of diabetes, food habit of the children, blood sugar level of children, utilization of time by the children were some of the variables responsible for prevalence of other diseases among the children.

Keywords: Level of obesity; Socioeconomic variables; Significant association between diabetes and level of obesity; Logistic regression

Introduction

Child overweight and obesity are the most serious public health challenges of the 21st century worldwide , specially, in low and middle-income countries. It affects mostly the urban people [1,2]. The obesity for child and adolescents is measured by body mass index [BMI = weight in kg / (height in meter^2] , where children having BMI above the 85th percentile are considered as overweight and those who have BMI above the 95th percentile are considered as obese [3]. The level of obesity is increasing at alarming rate. In a global study in 2016 it was estimated that over 41 million [1] children under the age 5 years were overweight. The prevalence of overweight in adolescents is defined by BMI + standard deviation of BMI and obesity for them is decided by BMI + 2 standard deviation [1]. Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. Child obesity can lead to life threating conditions including diabetes, heart disease, sleep problems, cancer, liver disease, early puberty, eating disorders, skin infection, asthma and other respiratory problems [4]. The adolescent's obesity leads to the problem of hepatitis, sleep aponia, and increased intercranial pressure [5].

The other effects of overweight and obesity are psychological [6], depression [7], physical [8,9]. The early physical effect of obesity in adolescence is noted when it affects all most all the organ which leads to the increase rate of mortality in adulthood [4,10]. The causes of childhood obesity are genetic. Over 200 genes affect weight by determining activity level, food preferences, body type, and metabolism [4]. Family practices such as decreasing rate of breast feed, by mothers, stay home and utilizes electronic devices, less physical activity, food habit, specially, taking more calorie food from restaurant with less fiber [4,9,11], low socioeconomic status [12], eating habit of calorie- rich drinks [13]. However, the problem can be obviated by avoiding the sources of causes of obesity and encouraging the children and adolescents to be involved in physical activities. From the above discussion, it can be concluded that growing level of obesity among children and

youth and increasing the rate of prevalence of diabetes are of great concern throughout the world. Many of the complications are silent and often go undiagnosed. The obese children are at high risk for the development of early morbidity. Considering all these aspects discussed above, the objective of the study was planned to observe the joint relationship of level of obesity and prevalence of diabetes including prevalence of other diseases with other socio-economic factors which were more responsible for the variation in the level of obesity among children and adolescents under 18 years of age coming out from affluent families. The specific objective was to investigate the association of level of obesity of children and adolescents with some social factors. Also, to identify the responsible variable for other diseases.

Methodology

For the analysis it was decided to collect information from children of affluent families. In a separate [14,15] families of students of American International University - Bangladesh were identified as affluent families. Hence, it was planes to collect data from some randomly selected families of students of the above-mentioned university. In a previous study [16] it was reported that there were 7% overweight and obese children and youth in Bangladesh. Accordingly, we had decided to have a proportion of at least 7% overweight and obese children and youth with margin of error of 2% at 95% confidence. Accordingly, for a simple random sample the sample the calculated value of sample size was an=625. This sample size covered 6.6% students of the university. The sample students were selected by simple random sampling method and were expecting at least responses from 5% families of the students. However, information was received from 560 families, covering the data of 662 children.

The data were collected through pre-designed and pre-tested printed questionnaire covering the questions related to the demographic characteristics of the children and adolescents of age below 18 years and the questions related to the socioeconomic variables of the parents. The randomly selected students were given written instructions how to collect information and they were requested to help in collecting information from their parents, who were very much concerned about the health hazard of their offspring. The parents of children filled in the questionnaires as some of the children were under 18 years of age and some were even below 10 years. The important collected information was age, height, weight, sex, food habit, time spent, involvement in co-curricular activities, if it is feasible, of the children, and information regarding the prevalence of any other diseases. To study the socioeconomic background of the children, the information regarding parent's level of education, occupation and income were also collected. For youth having diabetes, the latest blood sugar level measured by registered practitioner or measured in a registered clinic also recorded. Association of level of obesity of offspring with families' socioeconomic background were examined using chi-square test, where significant association was concluded when p-value ≤0.05. Logistic regression model using levels of prevalence of other diseases as dependent variable was fitted.

Result and Discussion

The present analysis was done using the data of social, medical and economic aspects of 662 children of age less than or equal to 18 years investigated from 560 randomly selected families of the students of American International University – Bangladesh. From the analysis it was noted that 22.8 percent children were affected by diabetes. This percentage among the obese and severe obese group of children was 32.2 indicating that level of obesity and prevalence of diabetes was significantly associated

[χ^2 =8.741, p-value = 0.033, Table 1]

Table 1: Distribution of respondents according to level of obesity and prevalence of diabetes.

Level of Obesity	Prevalence Of	Diabetes	
	Yes	No	Total
Underweight	109	356	465
n%	23.4	76.6	70.2
Overweight	23	114	137
N %	16.8	83.2	20.7
Obese,	16	26	42
n%	38.1	61.9	6.3
Severe obesity	3	15	18
n%	16.7	83.4	2.8
Total	151	511	662
n%	22.8	77.2	100.0

Considering the prevalence of diabetes among the obese and severe obese group compared to non-obese group, the former group were 69 percent more exposed to the problem of diabetes [O.R = 1.69]. Their risk ratio was 1.47 compared to non-obese group. Amongst the investigated children 70.2 percent were in underweight group and 9.1 percent were in obese and severe obese group. The level of obesity was measured by the amount of BMI (weight in kg / height in m^2). The mean value of BMI was 17.67 with a standard deviation 10.58. The underweight group of children and adolescents had BMI <23. The BMI of other three groups were 23 - <30, 30 - <45 and 45+. The levels of BMI were decided according to the percentile values. This finding was almost similar to that observed in another study [15]. Amongst the observed children and adolescent's 78.1 percent were in the age group 10 years and above and 70.2 percent of the investigated children and youth were in underweight group and 9.1 percent were obese and severely obese. Majority [Table 2, 78.2%] of them were in the age group 10 years and above and among them 72.6 percent were in underweight group. In these group obese and severe obese children were 6.9 percent. Major obese and severe obese children (19.4%) were among the children of age 5 to less than 10 years. The differences in the proportions of levels of obesity according to different age groups were significant [χ^2 = 39.043, p- value = 0.000]. The prevalence of obesity and severe obesity among the children of age group 5 to less than 10 years compared to children of other age groups were too high [O.R = 13.06]. Let us investigate

the prevalence of diabetes and prevalence of other diseases among the children and adolescents. It was observed that 86.6 percent investigated children had no other health hazard (Table 2) except diabetes. However, 21.2 percent of them were diabetic patients. Among the diabetic patient's 11.3 percent had eye problem. The major problem among the respondents was eye problem. The percentage of this group of children was 7.6. There were significant differences in the percentages of respondents facing health hazard according to prevalence of diabetes [χ^2 = 10.957, p-value = 0.027].

Table 2: Distribution of children according to prevalence of diabetes and prevalence of other diseases.

Prevalence of Diabetes	Prevalence of Other Diseases										Total	
	None		Eye problem		Kidney problem		Hypertension		Others		n	%
	n	%	n	%	n	%	n	%	n	%		
Yes	121	80.1	17	11.3	3	2.0	1	0.7	9	6.0	151	22.8
No	452	88.5	33	6.5	2	0.4	7	1.4	17	3.3	511	77.2
Total	573	86.6	50	7.6	5	0.8	8	2.8	26	3.9	662	

Now, let us investigate the reason of obesity and severe obesity among the children and youth. Some of the social factors might have enhanced the level of obesity. This was noted from the study of association of different factors and level of obesity. The investigated children and adolescents were classified into three classes by their age levels. These three groups of children were again classified by their level of obesity. The classified results were shown in Table 3. It was seen that 72.5% children and youth of the age group 10 years and above were underweight. The proportions of underweight children of other two age groups were lesser than the percentages of overall underweight group of children. The children less than 5 years of age had the highest percentage of the overweight group and this group of children had the 58 percent [O.R.=1.58] more chance of overweight compared to other groups of children. This differential in proportions of level of obesity according to age groups was highly significant [χ^2 = 38.94, p-value=0.000]. Amongst the studied children 58.2 percent were males (Table 4) and 77.4 percent of them were underweight. The corresponding figure among females is 60.3 percent. The differential in obesity by sex differences is significant [χ^2= 44.03, p-value= 0.00]. Number of children of different levels of obesity belonging to different residential areas were presented in (Table 5). It was seen that maximum village children (76.5%) were underweight compared to urban semi-urban children. Again, among the village children, number of obese and severe obese groups were lower compared to other groups of children. The differences in proportion. The information of 72.5% children were reported from urban area. The corresponding percentages of rural and semi-urban children were 18 and 9.5. The classified information of level of obesity and residence of children were significantly different [χ^2= 12.45, p-value= 0.04]. Similar findings were observed in other studies [14,15] It was already mentioned that the study group of children were mostly living in city center (72.5%) and though they had the enough scope to be involved in physical activities like games and sports, still majority of the children (39.9%) passed their time by watching television and 16.8% slept after or before their academic activities. One-fourth (26.4%) of the investigated children mentioned that they were involved in some other activities including games and sports (Table 6). Around 72% severe obese group killed their time by watching television. The corresponding percentage among obese group is 45.2. The differentials in proportions of utilization of time by the children of different obese groups were significantly different as [χ^2= 54.12 with p- value = 0.00]. Let us now observe the food habit of investigated children and adolescent. As the investigating units were mostly from affluent city residence, they had the scope to get sufficient foods, with proper hygienic measures. Among the investigating units' 47.9 percent were habituated in taking food from restaurants. Among the obese children 54.7 percent were habituated in takin restaurant food (Table 7).

Table 3: Distribution of children and adolescents according to their age and level of obesity.

Level of obesity	Age group (in years)						Total	
	<5		5-10		10+		n	%
	N	%	n.	%	n	%		
Underweight	26	61.9	64	62.1	375	72.5	465	70.2
Overweight	12	28.6	19	18.4	106	20.5	137	20.7
Obese	1	2.4	9	8.7	32	6.2	42	6.3
Severe obesity	3	7.1	11	10.8	4	0.8	18	2.8
Total	42	6.3	103	15.6	517	78.1	662	100

Table 4: Distribution of children according to their gender and level of obesity.

Sex	Level of Obesity								Total	
	Underweight		Overweight		Obese		Sever Obesity		n	%
	N	%	n	%	n	%	n	%		
Male	298	77.4	46	11.9	28	7.3	13	3.4	385	58.2
Female	167	60.3	91	32.8	14	5.1	5	1.8	277	41.8
Total	465	70.2	137	20.7	42	6.3	18	2.8	662	

Table 5: Distribution of children according to their residence and level of obesity.

Level of obesity	Residence						Total	
	Urban		Rural		Semi-urban		n	%
	n	%	n	%	N	%		
Underweight	341	71.0	91	76.5	33	52.4	465	70.2
Overweight	97	20.2	18	15.1	22	34.9	137	20.7
Obese	29	6.0	7	5.9	6	9.5	42	6.3
Severe obesity	13	2.8	3	2.5	2	3.2	18	2.8
Total	480	72.5	119	18	63	9.5	662	100

Table 6: Distribution of children according to their utilization of time and level of obesity.

Level of Obesity	Utilization of Time								Total	
	Study		Watch T.V.		Sleep		Others		N	%
	n	%	n	%	n	%	n	%		
Underweight	72	64.3	144	65.9	98	88.3	121	69.1	465	70.2
Overweight	34	30.4	58	22	7	6.3	38	21.7	137	20.7
Obese	4	3.6	19	7.2	3	2.7	16	9.2	42	6.3
Severe obesity	2	1.7	13	4.9	3	2.7	0	0	18	2.8
Total	112	16.9	264	39.9	111	16.8	175	26.4	662	100

Table 7: Distribution of children and adolescents according to their food habit and level of Obesity.

Level of Obesity	Food Habit						Total	
	Much more rice		More rice/fish& meat		Restaurant food		N	%
	n	%	N	%	n	%		
Underweight	56	12	191	41.1	218	46.9	465	70.2
Overweight	14	10.2	50	36.5	73	53.3	137	20.7
Obese	6	14.3	13	31	23	54.7	42	6.3
Severe obesity	2	11.1	13	72.2	3	16.7	18	2.8
Total	78	11.8	267	40.3	317	47.9	662	100

In a separate study [15] it was reported that the increasing trend of obesity was associated with fast food from restaurant. Of course, higher proportions of underweight (46.9%) and overweight group of children (53.3%) were habituated in taking restaurant food. However, the differentials in proportions of children taking restaurant food according to different levels of obesity were significant [χ^2 = 94.63 with p-value = 0.00]. Usually the children of affluent families were more likely to be stay back in the house and kill time by watching television. These children also had more chances to frequently visit fast food shops. Their parents could afford the cost of fast foods and they were also fulfilled the demand of their children if they had sufficient family income. It was observed that the monthly family income of 38.2% families was 70 thousand and above taka [Bangladesh currency] but 79.1 % children of these families were in underweight group (Table 8). It was seen that prevalence of obesity was higher among the children of low-income group of families. This differential in observing obesity was significantly different among the low-income group of families [χ^2 = 53.06 with p-value = 0.00]. Family environment was one of the correlates of obesity among children [16]. It seemed that family environment was influenced by parents' education and occupation. Let us investigate how fathers' and mothers' education were associated with children and adolescent's obesity. It was seen that (Table 9) the fathers of 77.9 % children were higher educated and 75% children of them were underweight. The percentage of illiterate fathers was 3.5 and 91% children of these fathers were underweight. But obesity and severe obesity among children of illiterate and primary educated fathers were more (8.7 and 17.4%

respectively) compared to the children of secondary educated (2.1%) fathers. The differential in proportions of level of obesity and fathers' educational level were highly significant [χ^2 = 111.70 with p-value = 0.00]. Similar significant differentials in proportions of obesity of children according to the differences of mothers' education were also observed [Table 10 χ^2 = 39.23 with p-value = 0.00].

Table 8: Distribution of children and adolescents according to their level of obesity and monthly Income.

Level of Obesity	Monthly Family Income (in 000 taka)								Total	
	<40		40-60		60-70		70+		n	%
	N	%	n	%	n	%	n	%		
Underweight	107	54.3	40	58.8	118	81.9	200	79.1	465	70.24
Overweight	62	31.5	13	19.1	15	10.4	47	18.6	137	20.69
Obese	24	12.2	3	4.4	11	7.7	4	1.6	42	6.3
Severe obesity	4	2	12	17.7	0	0	2	0.7	18	2.72
Total	197	29.8	68	10.2	144	21.8	253	38.2	662	100

Table 9: Distribution of children and adolescents according to their level of obesity and level of father's education.

Level of Obesity	Father's Education								Total	
	Illiterate		Primary		Secondary		Higher		n	%
	n	%	n	%	n	%	n	%		
Underweight	21	91.3	17	73.9	40	40.0	387	75.0	465	70.2
Overweight	0	0.0	2	8.7	56	56.0	78	15.1	137	20.7
Obese	0	0.0	4	17.4	2	2.0	36	7.0	42	6.3
Severe obesity	2	8.7	0	0.0	2	2.0	15	2.9	18	2.8
Total	23	3.5	23	3.5	100	15.1	516	77.9	662	100

Table 10: Distribution of children and adolescents according to their level of obesity and level of mother's education.

Level of Obesity	Mother's Education								Total	
	Illiterate		Primary		Secondary		Higher		n	%
	n	%	n	%	N	%	n	%		
Underweight	34	87.2	28	71.8	140	65.4	263	71.1	465	70.2
Overweight	1	2.6	8	20.5	65	30.4	63	17	137	20.7
Obese	2	5.1	3	7.7	6	2.8	31	8.4	42	6.3
Severe obesity	2	5.1	-	-	3	1.4	13	3.5	18	2.8
Total	39	5.9	39	5.9	214	32.3	370	55.9	662	100

There were 5.1 percent agriculturists and 79.4 percent children of them were underweight. The lowest underweight children were observed in those families where father was engaged in profession other that business and service. The maximum underweight children were observed in the families where father was a serviceman. The differential in proportions in different levels of obesity by father's occupation was significant [χ^2=67.281, p-value=0.000, Table 11]. However, mothers occupation had no impact on level of obesity of children and adolescents [χ^2=6.279, p-value=0.393, Table 12].

Table 11: Distribution of children and adolescents according to their level of obesity and levels of father's occupation.

Level of Obesity	Father's Occupation								Total	
	Agriculture		Business		Service		Others		n	%
	n	%	n	%	n	%	n	%		
Underweight	27	79.4	165	55.9	253	85.8	20	52.6	465	70.2
Overweight	2	5.9	100	33.9	31	10.5	4	10.5	137	20.7
Obese	3	8.8	27	9.2	9	3	3	7.9	42	6.3
Severe obesity	2	5.9	3	1	2	0.7	11	29	18	2.8
Total	34	5.1	295	44.6	295	44.6	38	5.7	662	100

Table 12: Distribution of children according to their level of obesity and level of mother's occupation.

Level of Obesity	Mother's Occupation						Total	
	Housewife		Service		Others		n	%
	n	%	n.	%	n	%		
Underweight	396	68.9	65	80.2	4	66.7	465	70.2
Overweight	123	21.4	12	14.8	2	33.3	137	20.7
Obese	40	7	2	2.5	0	0	42	6.3
Severe obesity	16	2.7	2	2.5	0	0	18	2.8
Total	575	86.9	81	12.2	6	0.9	662	100

Association between level of obesity and some social characters were studied by chi-square test. Here impact of social variables on obesity and prevalence of diabetes were not studied. It was done in some other study [19]. However, the impacts of social factors on prevalence of other diseases were studied. It was done by fitting the logistic regression model assuming levels of other diseases as dependent variable. The explanatory variables used were residence, religion, age, parent's education, parent's occupation, family income, food habit of children, utilization of time by the children, blood sugar level of them and body mass index. However, all the variables were not used in fitting the final model because during observing model fitting criteria some variables were found insignificant. These variables were age of children, gender of children and parents' occupation. The analytical results were shown below: From the fitted model it was noticed that prevalence of diabetes, level of obesity, and residence were the responsible factors for the prevalence of other diseases. The analysis was done considering no disease as reference factor Table 13. Thus, Model fitted results were available for the remaining 4 types of diseases. However, due to insignificant results in fitting the model for the diseases like kidney problem, hypertension and some other diseases the results were not presented. Results were presented only for the disease eye problem. This problem was prevailed among 7.6 percent respondents and this group was the biggest (56.2 %) among the children and adolescents who were experienced of different diseases. The fitted model was significant as was observed by the statistic – 2loglikelihood =364.489 and the corresponding χ^2 = 1696.824 with p-value =0.000. The value of Cox and Snell R^2=0.923 and Nagelkerke R^2= 0.961.

Table 13: Model fitting criteria.

Variable	-2loglikelyhood	χ^2	p-value
Residence	391.973	24.003	0.002
Religion	373.986	6.016	0.645
Age	387.713	19.743	0.011
Gender	368.596	0.625	0.968
Father's education	395.739	27.769	0.000
Mother's education	402.864	34.894	0.000
Father's occupation	382.098	14.127	0.293
Mother's occupation	380.143	12.173	0.144
Family income	394.461	26.491	0.009
Prevalence of diabetes	377.278	9.037	0.012
Blood sugar	390.380	22.410	0.033
Utilization of time	391.940	23.969	0.004
Obesity	394.941	8.440	0.002
Food habit	389.759	21.788	0.005

Conclusion

The present study was conducted to observe the level of obesity, prevalence of diabetes and prevalence of other diseases among children and adolescents of some randomly selected families of the students of American International University-Bangladesh. Most of the families were city dwellers and these families were socially and economically in better position [17-19] compared to the general people of Bangladesh. However, the obesity and severe obesity among children were similar to that of the general people of the country. Obesity and severe obesity were associated with the parent's social and economic status. Occupation, family income and age of children and youth were the most important factors to influence the level of obesity. The study indicated that prevalence of diabetes was dependent on level of obesity and both these characteristics were the problem for both parents and health planners. Parents can take care of foods of their offspring and motivate to take home foods as per as possible avoiding the restaurant foods Table 14. They can motivate their kids to spend

their time in doing some activities related to physical work in addition to their academic works. Logistic regression model was fitted to identify the responsible variable for the prevalence of other diseases. It was observed that family income, prevalence of diabetes and level of obesity were some of the responsible variables for the diseases.

Table 14: Results Related to Fitted Logistic Regression Model.

Variable	Level	B	Wald statistic	p-value	Exp(B)
Residence	Urban	-3.013	2.620	0.106	0.049
	Rural	-5.201	6.557	0.010	0.006
	Semi-urban	-5.085	6.220	0.000	0.000
Age	< 5 years	0.037	0.002	0.982	1.038
	5 – 10 years	-0.047	0.008	0.929	0.954
	10+ years	-	-	-	-
Father's education	Illiterate	17.088	0.000	0.997	*
	Primary	-2.200	0.000	1.000	0.111
	Secondary	-4.029	12.538	0.000	0.018
	Higher	-	-	-	-
Mother's education	Illiterate	-34.615	0.000	0.995	*
	Primary	-15.288	0.000	0.997	*
	Secondary	2.233	20.929	0.000	9.324
	Higher	-	-	-	-
Family income	< 40	1.458	7.744	0.005	4.296
	40 – 60	-0.081	0.011	0.917	0.922
	60 – 70	-0.547	0.692	0.405	0.578
	70+	-	-	-	-
Prevalence of diabetes	Yes	1.281	6.430	0.011	3.600
	N0	-	--	-	-
Food habit	Much more rice	0.738	2.481	0.115	2.091
	More rice, fish, meat	0.982	2.570	0.109	2.669
	Restaurant food	-	-	-	-
Blood sugar	Unknown	2.579	2.485	0.115	13.182
	6.3 – 7.0	2.314	1.905	0.168	10.118
	7+	-	-	-	-
Time spent	Study	-0.469	0.473	0.491	0.676
	Watching TV	-0.511	1.056	0.304	0.600
	Sleep	-2.182	8.147	0.004	0.113
	Others	-	-	-	-
Obesity	Underweight	-3.506	14.908	0.000	0.030
	Overweight	-2.139	5.137	0.023	0.118
	Obese	-1.962	3.988	0.046	0.141
	Severe obese	-	-	-	-

Problems of obesity are manifold. It is a life threating condition which can enhance diabetes, heart disease, cancer, liver disease, skin infection, asthma, and other respiratory problems [20,21]. Obese adolescents have increased chance of mortality during adulthood [22]. The problem also arises from the social environment. Hence, some measures need to be taken to control the problem. Government and school authority should introduce some regulations so that physical education is a compulsory co-curricular activity of the school. Parents can encourage their kids to avoid watching television and untimely sleeping and they can provide the quality school lunches. Kids should be provided fresh and healthy food and they should be accompanied to parks and to play field or walkways. They can be advised to avoid sedentary activities like use of mobile phone, computer, video games. Some of the steps of parents can prevent the alarming increase in the rates of obesity and severe obesity and in the rate of prevalence of diabetes and prevalence of other diseases.

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