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Original Article

Childhood Obesity, Overweight, Socio-Demographic and Life Style Determinants among Preschool Children in Babol, Northern Iran

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Abstract

Background: Childhood obesity and overweight are a general public health concern in a transition society. Thus, the objective of the study was to determine the prevalence of overweight, obesity and their correlates with socio-demographic and life style related factors.

Methods: This cross-sectional study was conducted on 760 representative samples of preschool children aged 2 to 5 years in urban area of Babol, northern Iran. The weight and height were measured with standard method and the socio-demographic and life style data were collected by interviewing their parents. The diagnosis of overweight and obesity was based on CDC criteria.

Results: The prevalence rate of overweight and obesity were 11.8%, 15% respectively. There was no significant difference observed between sexes. The odds of overweight/obesity was elevated more than double in age 4-5 years compared with 2-3 years(OR=2.53, 95%CI:1.71-3.73). By parental education at university level, the odds ratio significant decreased compared with primary level (OR=0.34, 95%CI: 0.31-0.90 and OR=0.49, 95%CI: 0.34-0.98 for mothers and fathers respectively). Parental obesity is positively associated with overweight/obesity risk OR=2.67(95%CI: 1.75, 4.07) and 1.61(95% CI: 1.04-2.150) for mothers and fathers respectively). While spending ≥2 hours per day for Tv watching and ≥1 hours for playing with computer games tended to elevate the risk but not significant.

Conclusion: The findings indicate that overweight and obesity are high in preschool children in Babol. Increasing child age, parental obesity, spending more times on TV and playing with computer games are positively associated with overweight/obesity while parental education at university level is inversely associated.

Keywords: Childhood obesity, Overweight, Demographic, Life style, Iran

Introduction

Childhood obesity and overweight are a general public health concern in both developed and developing countries with the prevalence rate doubling during the past decades (1, 2). In particular, 25% of US children are overweight and 10% obese and time trend analysis shows that children gained more weight in recent decade (3, 4). Overweight children are more likely to be obese in adulthood about two times. The serious consequences of obesity on chronic conditions in adults such as hypertension, insulin resistance to type 2 diabetes, metabolic syndrome and cardio vascular diseases have been clearly established in several published reports (1, 5, 6). In addition to co-morbidity, obesity plays an important role on psychosocial limitations in quality of life of children

in terms of psychological, social, emotional and school functional performance (6-8).

In recent decades, Iranian children and adolescents had an experience with increasing this trend about 13.3%-24.8% overweight and 7.7% - 8% obese children and adolescents (9-11). The increasing rates of childhood obesity and overweight in a transition society like Iran, are essentially attributed to the rapid changing in life style related factors in recent decades, in particular nutritional transition and sedentary life styles such as spending more times on TV viewing and playing with computer games (9-11). For example, high consumption of fatty fast food with high caloric and lack of outdoor physical activity and spending more time indoor reduces energy consumption substantially (11, 12). Although the mechanism of overweight and obesity were not fully understood since several socio-demographic and life style related factors influence on its trend (13-20), however some evidences show that consumption of sweeten soft drink with reducing of outdoor activity has an important role on increasing the trend of overweight and obesity in children (12, 20). In the past decade, population living in north of Iran having an experience of rapid transition, a relatively high rates of obesity and overweight have been reported in adult (21) and adolescents as well (22). It seems that epidemiologic transi-tions are being occurred toward overweight in children under 5 years but there is no sufficient data to document this condition in this region.

Thus, the objective of this study was to determine the rates of obesity, overweight and their correlates with socio-demographic and life style factors among children aged 2 to 5 years.

Methods and Subjects

This cross-sectional study was conducted on 760 samples of preschool children aged 2-5 years in Babol, northern Iran in 2012. These samples were recruited via two stages cluster sample techniques. In first stage, 20 preschools were selected with proportional probability of number of children within each school. In second stage, 40 children aged 2 to 5 years (20 boys and 20 girls) were chosen randomly in each preschool. In a few selected preschool in which the number of children were less than 40, all available child were recruited. With presumption of obesity prevalence rate of 15%, the allocated sample size estimates this rate with maximum marginal error of 2.5% and 95% confidence level. All 760 selected subjects were healthy with no debilitating conditions or congenital disorders based on preschool child health records. An approval of study protocol was obtained from the Research and Ethic Committee of the Babol University of Medical Sciences. All parents gave an informed consent for participation of their children into the study.

Measurements and data collection

The data were collected for anthropometric measurements of child in the preschools and by interviewing with their parents with refusal rate of less than 5%. Weight was measured to the nearest 0.1 kg using a digital portable scale with light cloths and no shoes and the height was measured to the nearest 0.5 cm using a portable stadiometer. Then, BMI was calculated as weight in kg divided by square of height in m^2. The demographic and life style related data were collected by interviewing with parents using a designed questionnaire. The data of age of child, sex, order birth, family size, parents' age, educational level, occupation, weight and height were collected. The life style related data were obtained in the recent past week activity including, the time spending on Tv watching and playing with computer games per day, the number of day per week playing in outdoor activity and the time spent per day as well. The number of day per week and the amount of time spent in riding bike per day and also the number of day for walking and the amount of time spent per day. A combined index of outdoor physical activity was calculated as the total hours per week (h/w) spent including playing, riding bicycle and walking. The reliability of measurement data were assessed by interclass correlation (>0.90).

The diagnosis of childhood overweight and obesity was based on CDC criteria (23). The BMI for age and sex of each child was compared with

CDC percentiles of BMI for age and sex. Then BMI for age and sex were categorized in four groups as obese (BMI≥95th percentiles), overweight (BMI≥85 and <95th percentiles), normal (BMI≥5th and <85th percentiles) and underweight (BMI<5th percentiles).

Statistical Analysis

In statistical analysis, we used SPSS software of version 18.0 and in bivariate analysis we used two independent samples *t*-test for normal distributed continuous data and Wilcoxon rank test for skew data and the Chi square test for categorical data. In addition, we applied the logistic regression model to estimate the odds ratio and its 95% confidence interval for socio-demographic and life style related factors associated with childhood obesity/overweight and the *P*-value <0.05 were considered as significant. In analysis, the age of child was categorized as 2-3 years and 4-5 years. In addition, physical activity level was categorized as low (<7h/w), moderate (7-20 h/w) and high (≥21 h/w) and TV watching as <2 h/day and ≥2 h/day and playing with computer games as ≥1 h/d versus <1 h/d compared. Moreover, parental obesity was defined based on WHO criteria as BMI of 30 or more.

Results

Of 760 participants, 375 (49.3%) were boys and 385(50.7%) girls and the respective mean age (±SD) were 4.23± 0.97 and 4.24±1.0 respectively. The most participants (67.3%) were at first birth order and only 3.3% were at birth order of 3 or higher. Regarding to parental educational level, over 80% of mothers and father were at educational level of high school/college or higher and 37% of mothers and 36.1% of fathers at university level and only 2.4% of mothers and 5.4% of fathers were at primary level. The majority of family (58.8%) was at size of 3 and only 5.9% was 5 or higher. With regard to parental occupation, 59.1% of mothers were housewives and 30% of fathers were businessmen, 18.7% clerks, 15% workers, 10.7% engineers/medical doctors, 5% teachers and the reminder had other occupations. Table 1 show that there is no significant difference in the mean of weight, height and BMI between boys and girls and with a similar mean age.

Table 1: The mean of anthropometric measures, demographic and some life style factors in boys and girls

Characteristics	Boys (n=375) Mean±SD	Girls (n=385) Mean±SD	*P*-value
Age (yr)	4.23 ±0.96	4.24 ±1.0	0.85
Weight (kg)	17.6± 3.97	17.2± 3.81	0.13
Height (cm)	104.7 ±8.29	104.3 ±9.0	0.56
BMI (kg/m²)	16.0 ±2.42	15.76± 2.61	0.25
TV viewing (h/day)	2.76 ±1.93	2.60 ±1.80	0.23
Playing with computer games┣(h/day)	0.43 ±0.92	0.26 ±0.63	0.01
Physical activity index┣ (h/week)	9.54± 9.32	8.0 ±8.01	0.02

┣The Wilcoxon rank test was used because of skew distributions.

While boys had significantly higher level of hours spending on physical activity per week compared with girls (9.54±9.32 versus 8.0 ±8.01 hours per week, *P*=0.01 and also higher time spending on playing with computer games (0.43 ±0.92 versus 0.26± 0.63 hours per day, *P*=0.005) but no significant difference of hours spending on TV watching per day (*P*=0.23). The majority of participants (53.1% boys and 58.9% girls) had low level (<7 hours per week) of outdoor physical activity and

only 41 (10.9%) of boys and 30(7.8%) of girls had at high level (≥21 hours per week). Table 2 shows that on overall, the prevalence rate of underweight, overweight and obesity were 16.7%, 11.8% and 15% respectively. There was no significant difference observed between sexes (16.3%, 11.5% and 16.8% for boys and 17.1%, 12.2% and 13.2% for girls respectively).

Table 2: Prevalence of overweight, obesity and underweight among children with respect to age group and gender

Age group	BMI status	Boys (n=375) No. (%)	Girls (n-385) No. (%)	Total (n=760) No. (%)
2-3 years	Underweight	19 (16.4)	39 (31.0)	58(24.0)
	Normal	78(67.1)	68(54.0)	146(60.3)
	Overweight	8(6.9)	9(7.1)	17(7.0)
	Obese	11 (9.5)	10(7.9)	21(8.7)
4-5 years	Underweight	42(16.2)	27 (10.4)	69(13.3)
	Normal	130(50.2)	153(59.1)	283(54.6)
	Overweight	35(13.5)	38(4.7)	73(14.4)
	Obese	52(20.1)	41(15.8)	93(18.0)
Total	Underweight	61(16.3)	66(17.1)	127(16.7)
	Normal	208(55.5)	221(57.4)	429(56.4)
	Overweight	43(11.5)	47(12.2)	90(11.8)
	Obese	63(16.8)	51(13.2)	114(15.0)

The rates of overweight and obesity significantly elevated in age group 4-5 compared with 2-3 years(P=0.001) but the rate of underweight was diminished significantly across age groups among girls but not for boys. Table 3 shows the results of logistic regression analysis. The odds of overweight/obesity was elevated more than double in age 4-5 years compared with 2-3 years(OR=2.53, 95%CI:1.71-3.73). By parental education at university level, the odds ratio significant decreased compared with primary level (OR=0.34, 95%CI: 0.31-0.90, and OR=0.49, 95% CI: 0.34-0.98 for mothers and fathers respectively). By higher birth order (3 or more), the odds ratio was elevated more than two folds significantly (P=0.02). In addition, the higher family size tended to be at higher odds of overweight/obesity. Spending ≥2 hours per day for TV watching and ≥1 hours for playing with computer games tended to elevate the odds of overweight/obesity (OR=1.31, P=0.13 and OR=1.46, P=0.06 respectively). In addition, no significant association was observed between parental age and children physical activity level with overweight/obesity but children were at higher risk of overweight/obesity with parental obese significantly. Moreover, when all characteristics entered into the multiple logistic regression models, the association of child age and parental obesity remain significant only.

Discussion

The findings of this study indicated high prevalence rate of overweight/obesity among children living in Northern Iran. There was a positive relationship between childhood overweight/-obesity with ageing, birth order higher than 3, parental BMI and negative relationship with the father's education at university levels.

There was no association with physical activity, family size, and duration of sedentary activities like TV viewing and playing with computer games, mother's educational level, and parental age. However, multiple logistic regression models demonstrated that only child ageing and parental obesity were significantly related to childhood overweight/-obesity. The results of this study on prevalence of overweight were rather similar in compared to the studies conducted in Iranian preschool children in Tehran (24) and Birjand, the east-south of Iran (25).

Table 3: The odds ratio (OR) of socio-demographic and life style related factors on the risk of overweight/obesity and its 95% confidence interval (95%CI) and *P*-value

Characteristics	No (%)	OR⊧ (95%CI)	*P*-value
Age group			
2-3 y	242(31.8)	1(-)	-
4-5 y	518(68.2)	2.53(1.71-3.74)	0.001
Sex			
Girls	385(50.7)	1(-)	-
Boys	375(49.3)	1.15(0.84-1.59)	0.38
Mothers' education			
Primary	18(2.4)	1(-)	-
Elementary	81(10.7)	0.41(0.14-1.18)	0.10
High school/college	380(50.0)	0.55(0.21-1.42)	0.22
University level	281(37.0)	0.34(0.13-0.90)	0.03
Fathers' education			
Primary	41(5.4)	1 (-)	-
Elementary	124(16.3)	0.74(0.35-1.55)	0.42
High school/college	318(42.1)	0.67(0.34-1.33)	0.25
University level	273(36.1)	0.49(0.34,0.98)	0.04
Family size			
3 or less	447(58.8)	1 (-)	-
4	269(35.4)	1.03(0.73-1.45)	0.86
≥5	44(5.8)	1.46(0.75-2.18)	0.26
Order birth			
1st	510(67.3)	1 (-)	-
2nd	223(29.4)	1.05(0.74-1.50)	0.77
≥3	25(3.3)	2.64(1.17-5.93)	0.02
Physical activity level			
Low	425(56.0)	1(-)	-
Moderate	263(34.7)	0.77(0.54-1.10)	0.16
High	71(9.3)	0.98(0.56-1.72)	0.96
Tv Watching			
<2 hour/day	249 (32.8)	1 (-)	
≥2	509 (67.2)	1.31 (0.92-1.82)	0.13
Playing with computer games			
<1 hour/day	628 (82.6)	1 (-)	-
1≥1	132 (17.4)	1.46 (0.97-2.19)	0.06
Mother's age			
<30 y	344(45.3)	1(-)	-
≥30	416(54.7)	1.04(0.75, 1.43)	0.83
Father's age			
<30 y	112(14.7)	1(-)	-
≥30	645(85.2)	1.17(0.73-1.87)	0.50
Mothers' BMI			
<30 (kg/m²)	659(86.3)	1(-)	-
≥30	104(13.7)	1.61 (1.04, 2.150)	0.03
Fathers' BMI			
<30 (kg/m²)	651 (86.0)	1 (-)	-
≥30	106(14.0)	2.67(1.75, 4.07)	0.001

⊧The odds ratio was derived from logistic regression model when each variable entered into the model once at a time.

While the rate of obesity/overweight was lower than ours compared to study with similar age group in Yazd, the central part of Iran (26). Nevertheless, there are large variations in the prevalence of childhood obesity across various studies conducted in Iran and our neighborhood countries (26-29). In contrast, surprisingly a very high rate of obesity/overweight was reported by Dorosty et al in the two large provinces of Iran in north (Gilan) and south (Sistan), as high as they are in the United States (9). In comparison to the results of studies on prevalence of childhood overweight/obesity in preschool children in our neighborhood countries and developing countries were in transition state, our findings is comparable with those reported in Bahrain and Egypt but it is much higher than UEA and Pakistan (27, 28). The dissimilarity of results at national level and across neighborhood countries could be explained by environmental factors such as variation in life styles and socio-economic status, climate and secular changes and also different definition of cut off used for overweight/obesity in children. In addition, the prevalence of overweight and obesity in Turkish children aged less than 7 years was lower at 10% and 4.9% without gender difference (30) and in Chinese preschool -age children with mean age of 5.02 years, the respective prevalence of overweight and obesity was 11.27% and 11.72% respectively (16) that are rather consistent with our findings.

Several factors including, reduced physical activity, family factors, nutritional factors like nutrition transition, higher derivation of energy from foods, increased sweetened drink consumption, frequent intake of foods outside the home and lifestyle have been associated with childhood obesity. Any of these parameters may differently affect the status overweight/obesity across various populations and so should be considered for explanation of these variations (1, 3, 4, 15, 19, 31). In a study of preschool children aged 3-6 years with different lifestyle living in Tehran, Iran, the prevalence of overweight, and in particular obesity in both genders was lower at 9.8 % , 4.77% in boys and 10.3%, 4.49% in girls (24).

The contribution of parental factors in development of children obesity has been shown in other studies (15, 18, 19). Parental obesity is a strong risk factor of obesity in children (32). Maternal and paternal anthropometrics affect early growth in pre-school children differently. Gestational weight gain in mothers without overweight/obesity was related to the risk of overweight in early childhood (33).

Contrasted to our results, higher parental education at college-level or higher compared with high school-level or lower, and family size, were independently associated with BMI in Pakistani children (18). In the present study increasing age and parental obesity were the most determinants of childhood obesity. The impact of ageing on prevalence of overweight and obesity has been reported in a study that addressed this issue among various age groups of study populations from Eastern Mediterranean Region (17). There was a link between weight gain at earlier age and later obesity. Weight gain in the first 6 months was shown as a predictive parameter of later obesity risk (34).

In a systematic review of papers published between 1990 and 2011, the prevalence of overweight/obesity increased from 1.9% to 21.9% in children less than 5 years old and 7% to 45% in school children, and 25% to 81.9% among adults population (17). In Danish representative survey of preschool children, overweight and obesity at 5 years was strongly associated with overweight and obesity at 3 years (35).

Obesity during the childhood period is of particular concern, because, obesity in this age group is associated with increased risk of several conditions not only during youth but also later in life, including diabetes, arterial hypertension, coronary artery disease, fatty liver disease, the early-onset metabolic syndrome and dyslipidemia. In addition, childhood obesity accelerates atherosclerosis progression already in children and young adults (36, 37).

In this study greater physical activity in boys was not associated with lower frequency of overweight/obesity. This may be attributed to difference in calories taking in boys versus girls, because both over-consumption of calories and reduced physical activity are known causes of overweight

and obesity in children (3). Lack of relationship between physical activity and overweight/obesity may be also attributed to methodological limitation of cross sectional nature of this study.

Recognition of responsible factors of children obesity can be used as a tool for implementation of preventive measures. Lifestyle interventions can lead to improvements in weight and cardiometabolic outcomes (38, 39). Parental weight was shown to be an independent and the most influential factor of childhood obesity (37, 39, 40). Targeting family-based responsible factors of children obesity is the most effective way for reducing the prevalence of children obesity (41). Parents influence on children eating habits and feeding practices. Feeding practices and behaviors are related with child weight in different cultural groups (42, 43).

The findings of this study also provide an alarming for health policy makers about the extent of problem of underweight and malnourishment of protein energy that are still high in this study population, in particular, in age group of 2-3 years. The relative high rate of underweight along with high rate of overweight/obesity indicates double burden of diseases in transition population of developing countries. A similar finding also has been reported in other developing countries as well at the stage of epidemiologic transition (44, 45). The results of this study should be considered with limitations. We did not provide data in regard to calories intake and feeding habits in this study. Nutritional factors like higher derivation of energy from foods, increased sweetened drink consumption, frequent intake of foods outside the home can counteract the influence of physical activity and result in overweight/obesity (3, 11). However, these factors are expected to affect both sexes with low or high physical activity and therefore the results should not be affected.

Conclusion

Our results indicated high prevalence of overweight/obesity in children living in northern Iran which is positively associated with parental weight and ageing. Regarding childhood obesity as a risk factor for development of many conditions like as metabolic syndrome, hypertension, diabetes and cardiovascular diseases during adulthood, identification overweight and obesity during childhood period and preventive measures for correction of associated risk factors is expected to provide long-term benefits during later stages of life.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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