When does obesity begin in northern Iranian children?

Original Article

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Abstract

Background: Identifying the onset of obesity in children can be helpful to design the prevention programs for obesity and its complications. The aim of this study was to evaluate the onset of obesity in children.

Methods: This cross-sectional study was conducted on the first grade of primary school children in Sari (urban areas) (Mazandaran Province, Iran) in 2014. The names and contact information of the first grade of primary school children (6–7 years old) were obtained through referring to Sari Health Center (Schools Health Unit). The onset of obesity was identified and recorded based on a body mass index (BMI) higher than 95% (for age and gender) and the weight/age and height/age Centers for Disease Control and Prevention (CDC) growth charts which were available in the child health records.

Results: There were 127 obese children (71 boys, 56 girls) in the current study. The mean weight, height and BMI of children were 32.63±4.918 (kg), 123.02±5.166 (cm) and 21.52±2.369 (kg/m^2), respectively. Furthermore the chance of obesity increased as the child grew up and there was an upward trend from 3 to 6 years old.

Conclusions: According to the results the obesity frequency remains high; thus, it is important to pay special attention toward children's weight gain during this period even if it is not within the overweight/obesity range.

Keywords: Obesity, Child, Overweight, Body Mass Index

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Introduction

Childhood obesity as a serious health problem has long-lasting and adverse consequences for communities, individuals and families [1]. Obesity and overweight which can impair the health condition are described as excessive and abnormal fat accumulation. The obesity is a body mass index (BMI) ≥30 kg/m^2 according to the WHO definition [1], and based on the Centers for Disease Control and Prevention (CDC) Children Growth Charts, the BMI z-score≥2.33 or BMI ≥95th percentile is obesity [2]. Now, one of the most important public health problems is obesity in the world. The frequency of obesity has been doubled in the worldwide from 1980 to 2014. In 2013, 42 million children less than 5 years old were overweight or obese. The rate of increase of childhood obesity and overweight has been more than 30% higher in developing countries than in developed countries [3]. One-third of adolescents and children in the United States are either obese or overweight [4]. In Iran, the rate of overweight and obesity at the beginning of primary school was 17% in 2010 [5]. Multiple factors such as environmental factors (sedentary lifestyle or an elevated calorie intake), shortened sleep, medications (tricyclic antidepressants, monoamine oxidase inhibitors, carbamazepine and valproate) and some endocrine diseases (hypothyroidism, cortisol

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excess, growth hormone deficiency, and pseudohypo-parathyroidism) are associated with obesity [6-8].

The comorbidities of obesity in childhood and adolescence include abnormalities in the endocrine, cardiovascular, gastrointestinal, pulmonary, orthopedic, neurologic, dermatologic and psychosocial systems [9]. On the other hand, the childhood obesity, tending to persist into later life can enhance the risk of obesity-related disease in adulthood.

According to the various scientific evidences and literatures, the risk of obesity begins early in life, More than half of obese children get overweight by 2 years old and nearly one-fifths of children are obese or overweight by the age of 6 [10, 11]. Several studies have suggested that the onset of obesity occurs from 4 months to 4 years [12-17]. However, based on available databases, there were no evidences for similar study in northern of Iran. The aim of the current study was to evaluate the onset of obesity in children, accordingly to design and facilitate the preventive programs by health-care sectors. The result of the present study would hopefully hinder the frequency of obesity and reduce the associated comorbidities.

Methods

This cross-sectional study was conducted on primary school children in Sari (urban areas) (Mazandaran Province, Iran) in 2014. Firstly, referring to Sari health center (Schools Health Unit), the objectives of the study were explained to authorities to engage them and benefit from their support in the current research. Secondly, the names and contact information of the first grade of primary school children (6-7 years old) with a BMI (body mass divided by the square of the body height kg/m^2) [18] higher than 95% for age and gender (those with BMI between the 85th and 94th (inclusive) percentiles were overweight, while those ≥95th percentile were obese) were asked from this center [19].

Inclusion Criteria

1) Children who were enrolled in the first grade (6y, 11m, and 29d) in Sari (urban areas),
2) Children with BMI greater than 95% (for age and gender).

Exclusion Criteria

1) Birth weight more than 4 kg.
2) Underlying disease such as hypothyroidism, Cushing's syndrome, pseudohypoparathyroidism
3) Obesity caused by taking certain medications such as corticosteroids
4) Stunt child (height below the 3rd percentile for age and gender, or 3.5 SD lower than the average height for age and gender).

The present study was elaborated for the parents and ensured them about the confidentiality of the information. After obtaining written consent form from the parents, their children were entered into the current study. The parents answered the questions of questionnaire including a history of family (mother, father, sister or brother) obesity (if diagnosed or treated), the specific underlying diseases such as hypothyroidism, Cushing's syndrome and pseudohypoparathyroidism (if diagnosed or treated), and the use of specific medication (corticosteroids and so on). Then, by referring to the children schools, the child's weight and height were measured in standard conditions (the child was weighed without shoes with minimum dress using the same weight scale which set up with 5 kg balance scale each time, and the child's height was measured with minimal clothing and without shoes in standard conditions (four points of the body such as the soles of the feet, buttocks, shoulders and back of head touching the wall) using a standard wall stadiometer. Next, the BMI was calculated, and if it was still above 95% (according to BMI/age chart in both sexes), the primary selection was confirmed. Then, the data were obtained from Sari health center (Schools Health Unit) through referring to the health center where the child was being cared for and the children's growth charts from birth up to the age of 6 years were evaluated, too. Since the NCHS growth charts are used in children's care, so the age of the deviation of the weight curve above the 97th percentile was recorded in the weight/age chart and the child height was found in the height/age chart, too. The BMI was calculated at this age, and if it was greater than 95% (according to the BMI/age chart in both genders), it would be considered as the age of onset of obesity.

The obtained data were analyzed using SPSS 16. The mean and standard deviation index for normal data, the median and interquartile range indices for quantitative data with abnormal distribution and percentage index were used to describe the qualitative variables. T-test, Chi-square and ANOVA were used for qualitative statistic. $P<0.05$ was considered as significant level.

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Results

Totally, 127 obese children (71 boys, 56 girls) were entered into the current study via convenient sampling method. Among them, 117 children maintained normal weight at the birth time. More detailed data are presented in table 1. Mean weight and height of children were 32.62 and 122.77, respectively; furthermore, the mean of BMI was 21.58. Detailed data are illustrated in table 2. According to the gained data, none of the participants had past medical history and only 0.93 % of them had medication history. Based on the results of the present study, 58.80% of the participants were obese, 28.4% were overweight and 12.96% were neither obese nor overweight. In this study, 77.8% of the participants had regular periodic health care condition. Moreover, 22.22% of the participants had been referred to health care center irregularly (9.72% totally irregular, 7.87% irregular before time of obesity diagnosis, 4.63% irregular after time of obesity diagnosis). Figure 1 indicates the frequency of obesity onset among children up to 6 years old. According to this figure, as the child grows, the chance of obesity increases and there is an upward trend from 3-6 years old.

Table 1. Demographic data of the first grade of primary school children, Sari, 2014

Variable		Frequency	Percentage
Age (y/m/d)	6 y- 6 y, 5 m, 29 d	89	70.1
	6 y, 6 m- 6 y,11 m, 29 d	38	29.9
Gender	Male	71	55.9
	Female	56	44.1
Birth Weight (kg)	Lower than 2.5	10	7.87
	2.5-4	117	92.13
Neonatal Feeding Style	Breast Milk	115	90.6
	Formula	10	7.9
	Breast Milk+Formula	2	1.6
History of Obesity	Paternal	15	11.8
	Maternal	36	28.3
	Siblings	2	1.6
	Paternal and Maternal	36	28.3
	None	38	29.9

Table 2. Anthropometric data of the first grade of primary school children, Sari, 2014

Variable	Mean	Mode	SD	Min	Max
Weight (kg)	32.62±0.43	31	4.85	26	50
Height (cm)	122.77±0.41	123	4.72	110	138
BMI (kg/m^2)	21.58±0.21	20.83	2.40	18.67	31.87
Waist size (cm)	72.87±0.68	73	7.66	56	105
Hip size (cm)	79.03±0.65	80	7.36	47	100
W/H	0.92±0.01	0.91	0.12	0.75	1.83

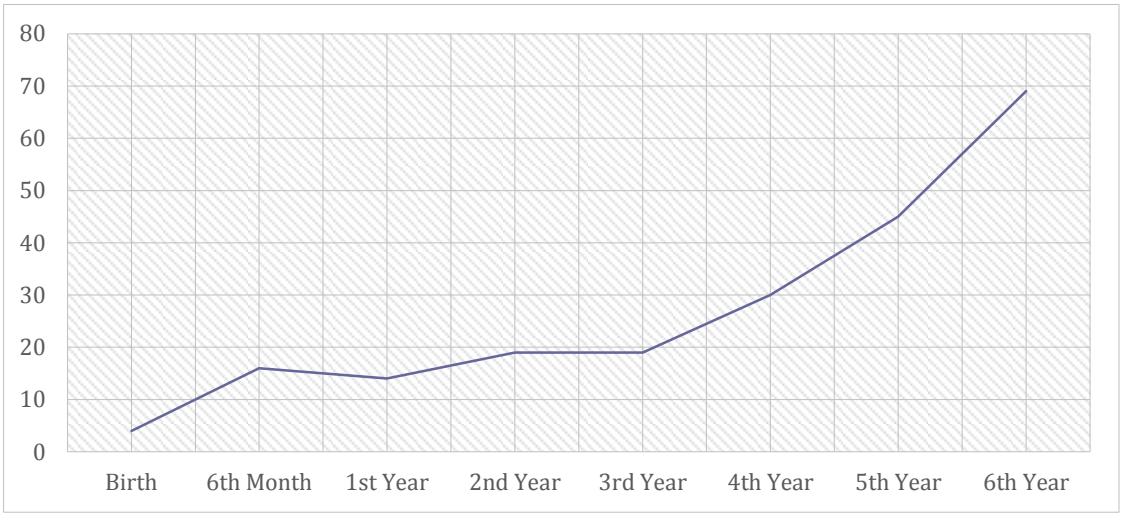


Figure 1. Frequency of obesity onset in the first grade of primary school children, Sari, 2014

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Discussion:

According to the results of the current study, the chances of obesity enhance as the child grows. The 50-year retrospective literatures based on global trends have suggested that the obesity of children has significantly increased up to now [20, 21]. Meanwhile, in the 1960s, the frequency rates have quadrupled in many countries [21]. Various comorbid conditions (obesity-related sleep apnea, non-alcoholic fatty liver and type-2 diabetes) are diagnosed among children with obesity. Due to increasing trend of childhood obesity and following aforementioned medical conditions, it is necessary to screen the obesity in children and implement the proper interventional procedure.

The finding of McCormick et al. is consistent with that of the present study , Although they have postulated that an alarming trend in childhood obesity (<7 years old) has raised debate as to whether the obesity can or should be diagnosed even during infancy, this claim has not been practicality confirmed, yet. [22].

Furthermore, it has been concluded that the level of obesity increases during 3-6 years old, this finding is similar to the study of Lo JC et al. who have concluded that obesity and severe obesity are evident as early as age 3-5 years, too [23].

It is important that the onset of obesity which remains undiagnosed maybe occurs even sooner than what is estimated, the lower frequency and irregular periodic health care conditions can be the influential factor regarding this matter. A study stated that the early onset of obesity as young as age 5 years old is associated with higher metabolic syndrome risk. In their study, the children followed from infancy were assessed at age 5 years and in adolescence, so the obesity developing between infancy and 5 years old might be missed [24].

Another study was conducted on 1824 black children aged from birth to 20 years and declared that the distinct weight trajectories can be emerged as early as 5 years old [25]. As shown in a study, the susceptibility to obesity can start in utero and in early life [26]. There are some robust risk factors including maternal−uterine restraint and rapid early catch−up growth for the development of obesity and its complications. Although tendency toward obesity maintains rigorous ties with genetic predisposition, influential role of environment cannot be denied. For instance, recently, it has been postulated that the spread of obesity happen via social ties [27], meaning that the obesity risk is enhanced over 57% and 40% if the friends and partner are obese, respectively. Hence, the risk of obesity is increased with exposure of the child to social interaction and probably obese individuals.

The present study has suggested that the upward trend of obesity is from 3rd year when the child tends to step into the new world and explore his/her environment, to meet the environmental factors such as increased intake of high-calorie foods and activity reduction because of recent lifestyle changes [28]. Although according to the results of the current study there is still no consensus regarding the exact onset of obesity among children, the lack of proper and regular screening in Iranian children under age of 7 should be considered. Hence, it is advised for health sectors to regulate some strict screening procedures in order to mediate and control the childhood obesity, and hopefully hinder the future health problems.

In conclusion, the present study has illustrated that the chance of obesity increases as the child grows and there is an upward trend from 3 to 6 years old. The obesity frequency remains high; thus, it is important to pay special attention toward children's weight gain during this period even if it is not within the overweight/obesity range.

Strength and limitations:

Because the periodic health care intervals, especially in the third year of life are prolonged (once a year), so the actual time of obesity onset may be earlier than that recorded in the files. Determining the exact time of obesity onset needs closer intervals of health care; therefore, if the BMI rapidly increases even before a child becomes overweight, it is necessary to do counseling and interventions.

This study emphasizes the need for continued recognition of early childhood obesity in order to prevent and control one of the important health problems.

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