



Changes of Overweight and Obesity Prevalence Among School Children in North West of Iran After 3 Years Follow-up (2009–2011): A Longitudinal Study

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How to cite this article: Nouri Saeidlou S, Rezaiegoyjelloo F, Ayremlou P, Babaie F. Changes of overweight and obesity prevalence among school children in North West of Iran after 3 years follow-up (2009-2011): A longitudinal study. *Int J Prev Med* 2016;7:79.

ABSTRACT

Background: Obesity and overweight among children is a major public health problem in developed and developing countries and has important health and economic implications. This longitudinal study aimed to assessing the prevalence trend of overweight and obesity in West Azerbaijan in North West of Iran.

Methods: This study was a longitudinal follow-up study and was conducted in school children at 2009–2011 year. The subjects were all school children (12 years of age) that were recruited from rural and urban schools in West Azerbaijan. Overall, 22,820 girls and 28,763 boys were enrolled in 2009 and were followed for 3 years. A body mass index (BMI) 85th–95th percentile was classified as overweight and a BMI >95th percentile was classified as obese. All statistical analyses were performed using the Excel Software. Descriptive statistics were used to characterize the sample in different time periods. The prevalence was calculated as the ratio of number of present cases to a given population number in a given subgroup at a given time.

Results: In urban schools, the prevalence of overweight among girls and boys was 118.26 and 103.9 per 1000 persons in 2009 year, respectively, and this trend was increased in both girls (152.90 per 1000 persons) and boys (125.72 per 1000 persons) in 2011. The obesity trend was increased among both girls and boys (22.26 and 26.52 among girls and boys in 2009 to 24.66 and 28.65 per 1000 persons in 2011), respectively. In rural schools, the prevalence of overweight among girls was increased from 84.5 in 2009 to 108.89 per 1000 persons in 2011, but this trend was decreased among boys (from 95.49 in 2009 to 43.9 per 1000 persons in 2011), and the prevalence of obesity among boys was increased at the end of follow-up, but this trend was decreased among girls.

Conclusions: Overweight and obesity in children has increased. Further studies are necessary to evaluate the relationship between obesity and overweight and risk factors such as dietary pattern and physical inactivity.

Keywords: Longitudinal study, obesity, overweight, prevalence, school children

Access this article online

Quick Response Code:



Website: www.ijpvmjournal.net/www.ijpm.ir

DOI:
10.4103/2008-7802.183651

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INTRODUCTION

Obesity and overweight among children is a major public health problem in developed and developing countries.^[1-4] Obesity in children is associated with a wide range of serious health complications, including diabetes, hypertension, hypercholesterolemia, musculoskeletal disorders, and heart disease.^[5-9] Without intervention, obese infants and young children will likely continue to be obese during childhood, adolescence, and adulthood.^[10-13]

Several studies show that in Iranian children the prevalence of overweight and obesity has increased^[14-16] but in children and adolescents, only a few longitudinal follow-up studies have been performed. Assessment of the trend of overweight and obesity using longitudinal studies compared with cross-sectional studies have found stronger evidences. The results of longitudinal studies are very important for planning appropriate interventions.

According to a single study, the prevalence of overweight was 5.1%, 4.5%, and 3.7% in Northwestern, Central, and Southern regions of Iran, respectively. Moreover, the prevalence of obesity in these three regions was 1.3%, 0.7%, and 0.1%, respectively.^[17,18] A study conducted in West Azerbaijan shows that the trend of overweight and obesity among school children has increased.^[19] This longitudinal study aimed to assessing the prevalence trend of overweight and obesity in West Azerbaijan in North West of Iran among 12 years of age children.

METHODS

The study was planned as a longitudinal follow-up study and was conducted in school children at 2009 year. Subjects were all school children (12 years of age) that were recruited from rural and urban schools in West Azerbaijan. Participants were all healthy children that recruited from public and private schools and according to the medical records of children who had the diseases which influence on overweight and obesity were excluded from the study (children with physical disability, diabetic, and children who use drugs). In Iran, the academic year runs for 10 months from September to June. The current data were from the annual survey in Iranian school children that was conducted in October month each year. Overall, 22,820 girls and 28,763 boys were enrolled in 2009. We used the data of a longitudinal study to evaluate the changes in overweight and obesity among children. Sample of children followed to 15 years of age in 2011 year. The total eligible sample enrolled after the 3-year included 18,846 girls and 28,282 boys. Nearly 4500 children were not assessed during follow-up period because they did not register in this region's schools. All data were collected by interviews and anthropometric measurements. For each district the team of data collection selected and after training, gathering of

data started in the whole of districts at the same time (8 to 12 o'clock every morning). Fixed health experts visited for anthropometric measurements at each school. Height and weight were measured with the highest accuracy. The body mass index (BMI) is defined as the body mass divided by the square of the body height ($\text{weight [kg]} / (\text{height [m]})^2$). Using Centers for Disease Control and Prevention cut-off points, a BMI 85th-95th percentile was classified as overweight and a BMI >95th percentile was classified as obese. The subjects were adjusted by age, sex, and region (urban and rural). All statistical analyses were performed using the Excel software. Descriptive statistics were used to characterize the sample in different time periods. The prevalence was calculated as the ratio of number of present cases to a given population number in a given subgroup at a given time per 1000 persons.

RESULTS

In the current study, totally, 22,820 girls and 28,763 boys at 12 years of age in urban and rural schools were recruited. In urban schools, a total 17,386 and 20,364 girls and boys were studied in the 2009 survey. Our finding showed that the prevalence of overweight among girls and boys was 118.26 and 103.9 per 1000 persons in 2009 survey, respectively, and this trend was increased in both girls (152.90 per 1000 persons) and boys (125.72 per 1000 persons) in 2011. Our findings showed that in urban schools, the highest prevalence of obesity observed among boys in both 2009 and 2011 years and the obesity trend was increased among both girls and boys as this trend was increased from 22.26 and 26.52 among girls and boy in 2009 to 24.66 and 28.65 per 1000 persons in 2011, respectively. In rural schools, a total 5434 and 8399 girls and boys were studied in the 2009 survey. Results showed that the prevalence of overweight among girls was increased from 84.5 in 2009 to 108.89 per 1000 persons in 2011, but this trend was decreased among boys (from 95.49 in 2009 to 43.9 per 1000 persons in 2011). The prevalence of obesity among boys in 2011 was increased compared to 2009 (from 13.22 to 24.79 per persons), but this trend was decreased among girls (from 37.73 to 20.9 per 1000 persons) [Table 1]. Totally, the prevalence of overweight was increased among both girls and boys at 15 ages of years compared at 12 age of years and also, the same trend was observed in obesity prevalence among boys but a few decreases were observed among girls [Figures 1 and 2].

DISCUSSION

Children who are obese are likely to be obese as adolescents and adults, and childhood obesity has both immediate and long-term effects on health and well-being.^[20] Evaluation overweight and obesity

during children is useful for the prevention of obesity and severe consequences later in adolescence and adulthood therefore, the aim of the current study was to evaluate longitudinal changes in prevalence trend of overweight and obesity in children. In this study during the follow-up, the drop-out rate was slow with 17.4% of girls and 1.6% of boys not reevaluated after 3 years. Loss to follow-up occurred in most longitudinal studies. In this study, missing is low compared to other studies.^[4,21-24] In general, studies are doing well that loss to follow-up has between 80% and 90%. Typically, some have suggested that <5% loss leads to little

bias, while >20% poses serious threats to validity. Indeed, a cut-off of 80% is used.^[25,26] In the current study, the loss to follow-up is missing at random and children characteristics who drop-out is more likely to of children that following. The higher of drop-out in girls due to lake of enough high schools in rural regions they did not continue education but the boys feel free to continue their education in urban schools. Loss over time is unavoidable, even in the best studies. The potential effects of missing data should be considered in the analysis.

Table 1: The prevalence of overweight and obesity among girls and boys in West Azerbaijan Province

Region	Cases (n)			
	12 years of age (2009)		15 years of age (2011)	
	Girls	Boys	Girls	Boys
Urban schools				
Overweight	2056	2116	2567	2962
Obesity	387	540	414	675
Population	17,386	20,364	16,789	23,561
Prevalence*				
Overweight	118.26	103.9	152.90	125.72
Obesity	22.26	26.52	24.66	28.65
Rural schools				
Overweight	459	802	224	207
Obesity	205	111	43	117
Population	5434	8399	2057	4721
Prevalence				
Overweight	84.5	95.49	108.89	43.9
Obesity	37.73	13.22	20.9	24.79
Total schools				
Overweight	2515	2918	2791	3169
Obesity	592	651	457	792
Population	22,820	28,763	18,845	28,282
Prevalence				
Overweight	110.21	101.45	148.09	112.05
Obesity	25.94	22.63	24.51	28

*Prevalence per 1000 persons

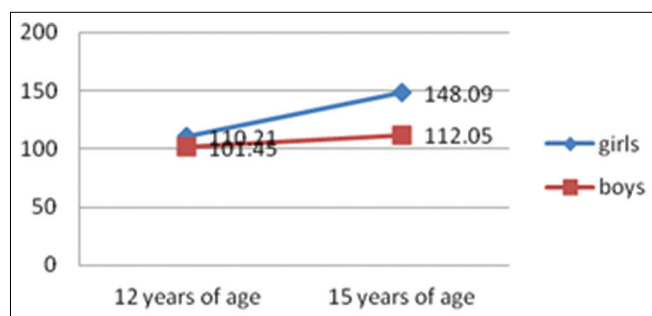


Figure 1: The overweight trends per 1000 persons among total school children in West Azerbaijan province

In the current study, the prevalence trend of overweight was increased among girls and boys from 110.21 and 101.45 per 1000 persons in 2009 to 148.09 and 112.05 per 1000 persons in 2011, respectively, that our findings consistent with other studies.^[16,27] Our results showed that overweight increased with age. Many factors such as lifestyle, nutrition, and maturation contribute in these differences. The current study showed that the prevalence of obesity among boys was increased at 15 years of age comparing 12 years of age, but this trend in girls was decreased slightly. The prevalence of overweight and obesity in urban children higher than rural children, this difference may be due to rural regions are known to have fewer food and lowest socioeconomic status that affect the nutrition status.^[28,29]

In summary, these results showed that the overweight and obesity has increased among school children at 15 years of age comparing 12 years of age in West Azerbaijan Province. The increasing of overweight and obesity due to unhealthy behaviors such as lack of physical activity, overconsumption of process and fast foods, and long sedentary games computers among school-aged children.^[30-33] Parents and children should be educated for cooking and healthy eating.

The main strengths of this study are follow-up design, large sample size, and low rate of lost to follow-up, with a quite long follow-up time and generalizability. A further strength of the current study is the use of

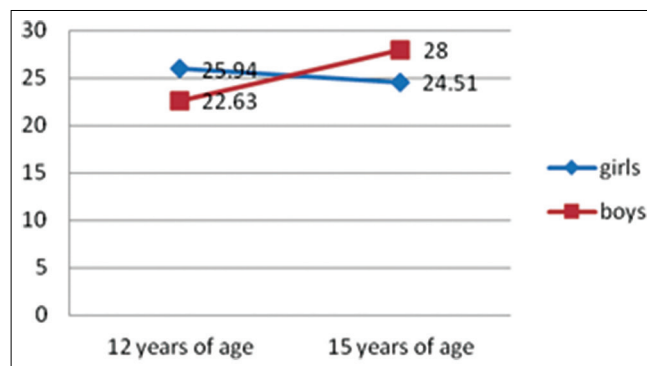


Figure 2: The obesity trends per 1000 persons among total school children in West Azerbaijan province

population-based methods. The limitations including the relationship between overweight and obesity with risk factors such as an unhealthy dietary pattern and physical inactivity have not been evaluated. We recommend further studies to assess the risk factors that influence on overweight and obesity in school-aged children. Despite these limitations, the current study offers an analysis of large sample children in a longitudinal follow-up study to determine the overweight and obesity pattern in school-aged children.

CONCLUSIONS

The prevalence of overweight and obesity in children has increased. Research on prevalence trend of overweight and obesity by longitudinal follow-up studies in children is poorly reported in Iran. Our findings also confirmed that further studies are needed to assess the relationship of overweight and obesity with unhealthy dietary pattern and physical inactivity that are important risk factors in children.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Received: 03 Aug 15 **Accepted:** 08 Mar 16

Published: 08 Jun 16

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