

Original Article**Secular trends in the national prevalence of overweight and obesity during 2007-2009 in 6-year-old Iranian children**

Mohammad Esmaeil Motlagh<sup>1</sup>, Roya Kelishadi<sup>2</sup>, Hasan Ziaoddini<sup>3</sup>,  
Parisa Mirmoghtadaee<sup>4</sup>, Parinaz Poursafa<sup>5</sup>, Gelayol Ardalan<sup>6</sup>,  
Marziyeh Dashti<sup>6</sup>, Tahereh Aminaee<sup>6</sup>

**Abstract**

**BACKGROUND:** This study aimed to determine the secular trends in the national prevalence of overweight and obesity among 6-year-old Iranian children, and to compare the results in Northern, Central and Southern parts of the country.

**METHODS:** The data were collected as part of a routine and mandatory national screening program on children entering elementary schools in 2007, 2008 and 2009.

**RESULTS:** The study population comprised 2,600,065 children including 862,433 in 2007, 782,244 in 2008 and 955,388 in 2009. Of total children 12.8%, 13.5% and 10.9% were overweight in 2007, 2008 and 2009, respectively ( $P > 0.05$ ). The corresponding figures for obesity were 3.4%, 3.5% and 3.4%, respectively ( $P > 0.05$ ). In all surveys, the prevalence of overweight was higher in Southern region than in the other two regions.  $P$  for trend was not significant for prevalence rates of overweight and obesity in any of the regions.

**CONCLUSIONS:** To the best of our knowledge, this study was the first of its kind in presenting the nationwide trend of overweight and obesity in young children living in a developing country. It showed a considerably high prevalence of overweight and obesity, but with a constant rate in three years. The higher prevalence of overweight in Southern region than in Central and Northern regions might be related to the lower socioeconomic position of this population. At a very young age, children's lifestyle is more under control of parents. Primordial and primary prevention efforts against the overweight epidemic can be effective and shall be further strengthened.

**KEYWORDS:** Prevalence, Trend, Overweight, Children, National Study, Iran.

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Childhood overweight and obesity has become as a public health problem worldwide, and is increasing both in developed<sup>1, 2</sup> and developing countries.<sup>3</sup> The World Health Organization (WHO) stated that an escalating global epidemic of overweight and obesity – “globesity” – is taking over many

parts of the world.<sup>4</sup>

Obesity related costs have been made a large part of total health care expenditures in many countries. This is of special concern for childhood obesity and its numerous short- and long-term health effects.<sup>5, 6</sup> Most studies on the prevalence of childhood overweight present

1- Associate Professor, Department of Pediatrics, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran AND Bureau of Family Health, Ministry of Health and Medical Education, Tehran, Iran.

2- Professor, Department of Pediatrics, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran AND Child Health Promotion Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

3- Physician, Bureau of Health and Fitness, Ministry of Education, Tehran, Iran.

4- Department of Clinical Pharmacy, School of Pharmacy, Isfahan University of Medical Sciences, Isfahan, Iran AND Child Health Promotion Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

5- Department of Environment Protection, Environment Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.

6- Youth and School Health Office, Ministry of Health and Medical Education, Tehran, Iran.

Corresponding Author: Roya Kelishadi

E-mail: kelishadi@med.mui.ac.ir

cross-sectional and local data, whereas time trend studies of national surveys are important not only to determine the prevalence of obesity but also to identify specific categories in which the prevalence is very high or in which strong increases in the prevalence of obesity are observed. In general, increasing trends in overweight among children and adolescents have been observed in many high-income countries.<sup>7-9</sup> In some European countries, such as Switzerland and Denmark, the escalating trend of childhood obesity is followed by a plateau,<sup>9, 10</sup> and in some, such as Denmark, this period was followed by a declining trend.<sup>9</sup> The limited available literature on trends of prevalence of childhood obesity in low- and middle-income countries demonstrated an escalating trend.<sup>11-13</sup> To the best of our knowledge, no previous study has described national trends of childhood obesity in developing countries.

The aim of our study was to determine the secular trends in the national prevalence of overweight and obesity among 6-year-old Iranian children undergoing routine and mandatory screening programs at school entry during 2007-2009, and to compare them in different regions of the country.

## Methods

The data were collected as part of nationwide screening programs in 3 consecutive years in 2007, 2008 and 2009. This program is regularly performed by the Ministry of Health and Medical Education and the Ministry of Education and Training among all children entering elementary schools. The methodology, which has been described previously,<sup>14</sup> was similar among the three surveys. Herein we describe the methods in brief, again. In all these surveys, all children entering elementary school in Iran were studied. Elementary education is mandatory in Iran, thus the study population comprised all children entering public and private elementary schools. Ethical concerns have been considered by the aforementioned ministries. The national Data and Safety Monitoring Board closely supervised the quality control and quality assurance of each survey.

Training sessions were organized for health-care providers who measured children's weight and height according to standard protocols by using calibrated instruments.<sup>15</sup> Body mass index (BMI) was computed as weight in kilograms divided by the square of height in meters. In all surveys, we used the growth charts of the Centers for Disease Control and Prevention,<sup>16</sup> which are in close agreement with Iranian charts.<sup>17</sup> Overweight and obesity were considered as age- and gender-specific BMI of 85<sup>th</sup>-94<sup>th</sup> and  $\geq 95^{\text{th}}$  percentile curves, respectively.<sup>16</sup>

Because of significant differences in the prevalence of overweight and obesity among adults in the Northern, Central and Southern regions of Iran, with similarities in the geographic and socio-demographic characteristics in each region,<sup>18</sup> in this study we compared the corresponding figures for children.

After editing, the data were analyzed using the Statistical Package for Social Sciences Statistical software package version 16:0 (SPSS Inc., Chicago, IL, USA). All analyses were initially stratified by gender, but as the differences were not significant, the results are presented for girls and boys in combination. A P-value of less than 0.05 was considered as significant.

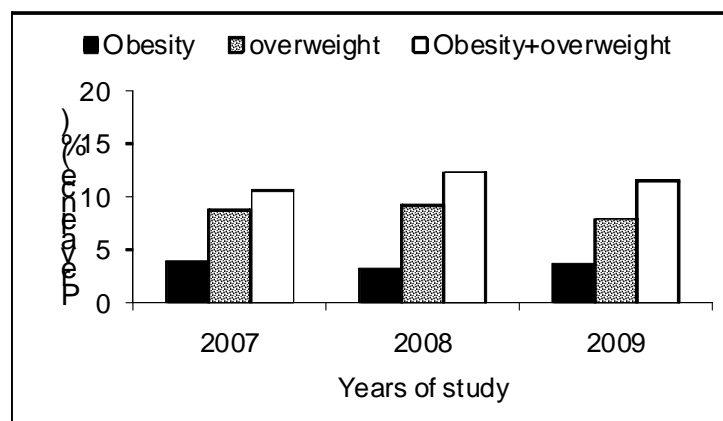
## Results

Data were obtained from all 6-year-old children entering elementary schools in all 30 provinces in Iran. The study population comprised 2,600,065 children including 862,433 in 2007, 782,244 in 2008 and 955,388 in 2009. Of total children, 12.8%, 13.5% and 10.9% were overweight in 2007, 2008 and 2009, respectively ( $P > 0.05$ ). The corresponding figures for obesity were 3.4%, 3.5% and 3.4%, respectively ( $P > 0.05$ ).

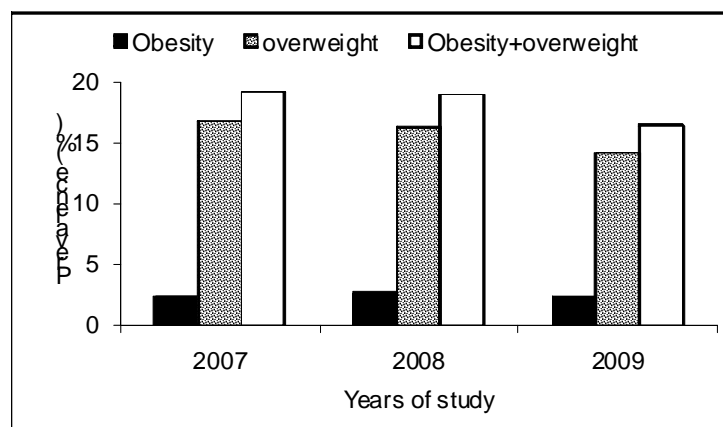
Figure 1 presents the prevalence and trend of overweight and obesity in the three regions of the country. In all surveys, the prevalence of overweight was higher in Southern region than in the other two regions. P for trend was not significant for prevalence rates of overweight and obesity in none of the regions.



a. Northern region



b. Central region



c. Southern region

P for trend > 0.05 in each region

**Figure 1.** Secular trends in prevalence of overweight and obesity in 6-year-old Iranian children during 2007-2009 in a. Northern, b. Central and c. Southern regions.

## Discussion

This study, presenting the national trend of about 2,600,000 children over three years revealed no significant difference of prevalence of overweight and obesity over a 3-year period (2007-2009). Various health policies have been implemented to improve the nutritional status of Iranian children from early life. The focus of most of them has been to control underweight and micronutrient deficiency. As recent national studies showed considerably high prevalence of overweight and obesity in Iranian adults<sup>18, 19</sup> and school-aged children,<sup>20</sup> in addition to the aforementioned policies, primordial and primary prevention of childhood overweight have been considered in the program of health professionals, notably pediatricians, general physicians and child health care providers. Moreover, in order to increase the public awareness about the importance of prevention and control of overweight in children, mass media programs were used as a tool to advocate for children's healthy lifestyle and more specifically preventing child overweight.

Given that small changes at the individual level may result in large benefits at the population level, such policies might have been effective, so that the childhood overweight and obesity rates have remained constant for at least three years. However, as some regional studies revealed increasing trend of overweight and obesity in adults<sup>21</sup> and school-aged children,<sup>22</sup> more intensive interventions and legislations are necessary to tackle obesity in older ages. At a very young age, children's lifestyle is more under control of parents and they can guide their children in making choices that will lead to healthier lives. By getting older, children may feel they have more power over their choice of foods and activity, and may adopt obesogenic lifestyle behaviors.

It is Noteworthy to mention that in all three surveys, children living in the Southern region had the highest prevalence of overweight. This higher prevalence might be because of differences in socioeconomic background of this region, as well as ethnic differences. In general, the Southern provinces in Iran have lower so-

cioeconomic position than other provinces. Some studies in developing countries reported higher rates of childhood obesity in higher socioeconomic populations,<sup>12</sup> whereas others reported it in lower socioeconomic class.<sup>23-25</sup> An increasing body of evidence showed that over the past years, a secular trend toward increase in obesity is more marked among children of lower than higher socioeconomic status, which might be because low-income households can affect a child's tendency to gain weight by higher intake of energy-dense foods, lower intake of complex carbohydrate, fruits and vegetables.<sup>26-29</sup> Moreover, regarding the ethnic differences in the prevalence and complications of childhood obesity,<sup>30, 31</sup> and considering the popularity of Arab ethnicity in Southern Iran, part of this difference might be explained by ethnicity. Future studies about lifestyle behaviors in this region might help to design more effective preventive and interventional programs.

In other viewpoint, although there was no significant increase in the prevalence of overweight and obesity in children at school entry, but in general, the prevalence of overweight is high at a level comparable to developed countries.

### *Study limitations and strengths*

Because of the very large sample size of the study in 3 consecutive years, details on socioeconomic background and lifestyle habits of the children under study could not be documented. The main strengths of the study are its novelty in reporting national trends of childhood overweight from a developing country, and the nationwide coverage of all school-entry children.

## Conclusion

To the best of our knowledge, this study is the first of its kind in reporting the nationwide trend of overweight and obesity among young children living in a developing country. It revealed a considerably high prevalence of overweight and obesity among young Iranian children, but with a constant rate in three years. The higher prevalence of overweight in

Southern region than in Central and Northern regions in all three surveys might be related to the lower socioeconomic position of this region. At a very young age, children's lifestyle is more under control of parents and they can guide their children in making choices that will lead to healthier lives, primordial and primary prevention efforts against the overweight epi-

demical can be effective and shall be further strengthened.

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### Conflict of Interests

Authors have no conflict of interests.

### Authors' Contributions

MEM participated in the design and conducting the study. RK participated in the design of the study, drafted and edited the manuscript. HZ participated in designing and conducting the study. PM conducted the statistical analysis and helped in drafting the manuscript. PP drafted and edited the manuscript. GA participated in designing and conducting the study. MD participated in designing and conducting the study. TA participated in designing and conducting the study. All authors read and approved the manuscript.

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