First nationwide survey of prevalence of weight disorders in Iranian children at school entry

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Background: **For the first time, not only in Iran but also in the Eastern Mediterranean region, we report the prevalence of underweight and overweight among all children at school entry.**

Methods: **The current study was part of the national screening survey of all children at school entry that was conducted in all 31 provinces of Iran in 2007. Body mass index (BMI) cut-off points provided by the US Centers for Disease Control and Prevention were used.**

Results: **This cross-sectional national study was performed among 899 035 children (48.8% girls and 51.2% boys); 76.7% of them lived in urban areas. Overall, 12.7% of the children had a BMI below the age- and gender-specific 5th percentile, and with the highest prevalence in the southern provinces. In addition, 17.0% of the children had high BMI levels, i.e., 13.5% were overweight and 3.5% were obese, with the highest prevalence in the capital city as well as in the western and northwestern provinces.**

Conclusions: **Until a few years ago, childhood undernutrition has been the major nutritional problem in our community and still is the focus of nutritional policies and related medical education curriculum; however the higher prevalence of overweight other than underweight obtained in the current national survey is alarming and confirms the importance of considering childhood overweight as a health priority. This should be taken into account for all Middle Eastern countries that are expected to bear one of the world's greatest increases in the burden of chronic diseases notably diabetes in the next two decades.**

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Introduction

Childhood growth and weight disorders are of major concerns both in developed and developing countries. In most high-income countries, the increasing prevalence of obesity has become the most common and serious nutritional disorder of children and its cardio-metabolic consequences are rapidly growing in Western countries.[1] Developing countries are moving along epidemiologic, demographic and nutrition transitions, and are facing a double burden of nutritional disorders; grappling with malnutrition and micronutrient deficiency, they are also experiencing considerable rates of childhood overweight.[2] However, most national public health programs and policies, as well as national-level researches on children in low- and middle-income countries are still focused on undernutrition and its effects on survival, mortality and development of mothers and children. In addition to its early health hazards during childhood,[3-5] overweight might have significant impact on chronic diseases and mortality rate later in life,[6,7] and it has been largely ignored in health strategies developed at national level in many low- and middle-income countries. This might be due to the fact that generally this medical condition is not recognized as a health priority partly because of the lack of national valid data about the prevalence of different weight disorders.

Similar to many other developing countries, Iran has been experiencing rapid urbanization and industrialization in recent decades.[8] The first national survey on nationally-representative sample of Iranians

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showed that the national estimates of underweight and overweight were respectively 5.7% and 42.8% among adult population,[9] and 13.9% and 13.4% among 6- to 18-year-old children and adolescents.[10] Local studies have been performed on the prevalence of weight disorders in younger children, and they have shown different prevalence.[11,12] Most of these studies have been too small or nationally unrepresentative for different provinces of vast countries like Iran with considerable diversity in socio-demographic factors.

We aimed to assess the prevalence of underweight and overweight among pre-school children. Because more than 80% of Iranian women do not work out of home, and a small percent of children attend kindergarten, performing the survey by selecting the children from their homes was difficult and expensive. In order to have a large sample of children, we conducted the study among children before entering primary schools (mandatory for all children at age of 6 years).

Methods

A screening program for school readiness is being conducted among all Iranian children before entering primary schools. It is performed by the Ministry of Education and the Ministry of Health. The current study was part of the national screening survey conducted in all target children in all 31 provinces of Iran in the year 2007.

The study was approved by the institutional ethics committees and other relevant national regulatory organizations. Written informed consent was obtained from parents and oral consent from the children. The Data and Safety Monitoring Board of the project closely supervised the quality control and quality assurance of the survey at the national level.

Trained health care providers measured height and weight using standard protocols: all instruments were standardized before the examination, and the balances were zero-calibrated; height and weight were measured twice to ±0.2 cm and to ±0.2 kg, respectively, with subjects barefoot and lightly dressed, and the averages were recorded.[13] Body mass index (BMI) was computed as weight in kilograms divided by the square of height in meters.

Since we had documented that for Iranian children,[14] the cut-off points used from the US Centers for Disease Control and Prevention (CDC)[15,16] are more appropriate than the definition provided by the International Obesity Task Force,[17] we used the CDC charts in the current study. A BMI level of <5th percentile was considered as underweight, and the levels of 85th-94th percentile and ≥95th percentile were considered as overweight and obesity, respectively.[16]

Data checking was conducted first at the district and then at the national level.

The data were analyzed using the SPSS software package (SPSS, Inc. Chicago, IL). Descriptive analysis was used to determine the frequency of children with BMI <5th percentile and those with BMI ≥85th percentile.

Results

This cross-sectional national study was undertaken among 899 035 children (48.8% girls and 51.2% boys), of whom 76.7% lived in urban areas. Most of the parents of the children were literate, 43.3% were the first children of their family and 97.0% lived with both their parents.

The prevalence of weight disorders did not differ in gender. The mean (SE) of BMI was 15.4 (0.1) kg/m^2. Overall, 12.7% of the children had a BMI below the age- and gender-specific 5th percentile. The southern provinces had the highest prevalence of underweight (Fig. 1). In addition, 17.0% of the children had high BMI levels, i.e., 13.5% were overweight and 3.5% were obese, with the highest prevalence in the metropolitan area of the capital city as well as in the western and northwestern provinces (Fig. 2).

Discussion

This is the first national report not only from Iran but also from the Eastern Mediterranean region (EMR) on weight disorders in children at school entry. Of special interest in this study is the higher prevalence of overweight other than underweight in young children, which provides alarming evidence for policy-makers and health professionals to pay more attention to screening, prevention and control of overweight from early life. This finding is in line with our previous national finding of the study conducted among a representative sample of school students, which showed a higher prevalence of overweight among elementary other than middle- and high-school students.[14]

Childhood undernutrition and failure to thrive have historically been the major nutritional problems in our community, and yet childhood underweight is still the focus of nutritional policies and medical education curriculum concerning childhood nutritional disorders, thus the higher prevalence of overweight other than underweight obtained in the current national survey is alarming and confirms the importance of this emerging problem in our community. It is one of the health priorities for this pediatric age group.

Fig. 1. Prevalence of body mass index <5th percentile (categorized to ≤10%, 10%-15% and ≥15%) in children at elementary school entry (*n*=899 035) in different provinces of Iran, 2007.

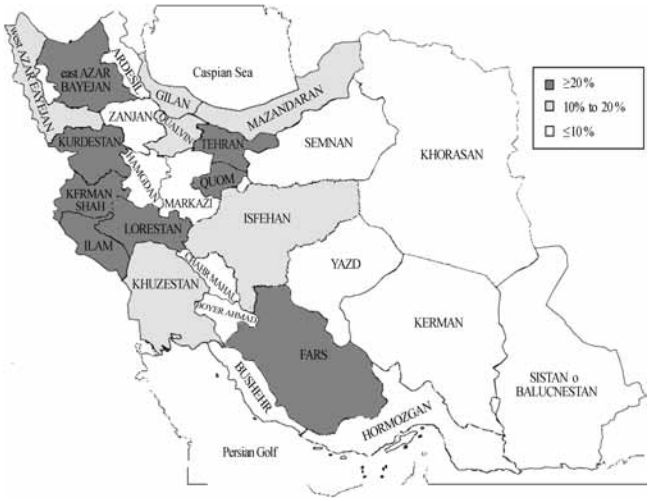

Fig. 2. Prevalence of body mass index >85th percentile (categorized to ≤10%, 10%-20% and ≥20%) in children at elementary school entry (*n*=899 035) in different provinces of Iran, 2007.

Our national study on a representative sample of 89 532 Iranian adults (aged over 15 years) showed a prevalence of 42.8% for overweight and obesity, i.e., 28.6% were overweight and 14.2% were obese.[9] This high prevalence of overweight among adults is another confirmatory evidence for the necessity of primordial/primary prevention of this weight disorder from early life.

One of the contributing factors to the prevalence of childhood overweight in our community is the general belief that a chubby child is healthier than the low- or normal-weight peers.[18] Historically in our community a fat child meant a healthy child who was likely to survive the rigors of different diseases. Overfeeding of children especially stunted children with diets of poor nutritional quality, characterized by high-calorie foods of low density and diversity, would lead to rapid weight gain later in childhood.

Furthermore, similar to many other countries in the EMR and the Middle East, Iran is facing epidemiologic transition, rapid changes in the demographic characteristics, speedy urbanization, and social development in the absence of steady and significant economic growth that all together have led to large shifts in dietary and physical activity patterns. Nowadays the Middle East has the highest dietary energy surplus of all developing countries.[19] This region has one of the highest prevalence rates of overweight[20] and is expected to bear one of the world's greatest increases in the absolute burden of diabetes in the next two decades.[21]

Clearly a national strategy is needed to integrate preventive measures including lifestyle modification, notably dietary change and encouraging physical activity, in the primary health care system and routine child health care programs at a population level.

The two comprehensive studies that have reviewed the prevalence of obesity in pre-school children worldwide estimated an overall prevalence of 3% in lower-income countries in the 1990s.[22,23] However, a more recent review on data for trends of weight disorders among pre-school populations in 42 countries revealed that the prevalence of childhood overweight has increased in almost all countries for which data are available; exceptions were found among pre-school children in some lower-income countries. The most dramatic increase was found in economically developed countries and in urbanized populations.[24]

By showing a prevalence of 12.7% for underweight, our findings confirm the double burden of nutritional disorder in the children of our community. This prevalence is slightly lower than the corresponding figure of 13.9% among a representative sample of older school students.[14] A paradox of childhood underweight/overweight and a rapid increase in childhood obesity and metabolic syndrome exist among children and adolescents living in many developing countries. It is reported that approximately half of the preschool-age children in Asia are malnourished with a prevalence ranging from 16% in China to 64% in Bangladesh. In addition to protein-energy malnutrition, Asian children also suffer from micronutrient deficiency.[25] The coexistence of underweight and overweight is a challenge to child health care and public health programs. Consequently, these programs should identify and consider the magnitude and demographic composition of dual-burden of weight disorders and then plan for targeted interventions. The etiology of weight disorders in low- and middle-income countries is complex and consists of interactions of numerous biological, cultural and socio-economic determinants. The economic and social trends in such

communities combined with changes in lifestyle, particularly changes in dietary patterns and the decrease in physical activity will exacerbate emerging problems of diet-related chronic disease. Meanwhile, this situation should not overshadow national and regional policies to improve child growth and reduce micronutrient deficiencies. One of the most important policies in this regard is to emphasize the role of the primary care providers in its timely assessment and management of weight disorders among children. A literature review about this issue has concluded that childhood obesity is largely under-diagnosed and under-treated in the primary health care systems.[26] It will be essential to integrate the education about the underweight-overweight phenomenon in the curriculum of different levels of health care workers.

Consistent with other nationwide studies in developed[27] and developing[28] countries, in the current study we found marked variations in the regional distribution of weight disorders. In addition to economic differences, the populations of various provinces in Iran have ethnic differences. Principal ethnic groups in Iran are Persian 51%, Azeri 24%, Gilaki and Mazandarani 8%, Kurd 7%, and Arab 3%. In the current study, underweight was more prevalent in southern provinces with lower socioeconomic background with most of the population from Arab tribe (in South-West) and Balouch (in South-East), and overweight was more prevalent in provinces with better socio-economic status as the metropolitan area of the capital city (most population of Persian and Turkish background) and North-Western (mostly Turkish) and Western (mostly Kurdish) provinces. In the current study we did not determine the determinants of weight disorders. But our previous national studies revealed that both in adults[9] and children[10], the low level of physical activity was a major determinant of overweight; furthermore improper dietary habits such as low consumption of fruits and vegetables was associated with overweight among children.[10] Two previous studies conducted in Tehran, the capital city,[29] and Rasht in North Iran[30] showed that physical inactivity was significantly associated with overweight among adults; it is noteworthy to mention that in the current study, childhood overweight was considerably prevalent in these cities. Moreover, the latter study showed that children of employed mothers were more likely to be underweight than children of non-employed mothers, and the relative risk for underweight was higher in the children of both less and highly educated mothers compared with children of mothers with an intermediate level of education.[30] More studies should be conducted on the ethnic and socio-cultural factors contributing to different types of weight disorders in children. Moreover, these findings confirm that policy-makers would need the details of such large differences in various parts of vast countries with a great diversity in socio-economic factors as well as cultural and lifestyle habits.

The main limitation of this study is its cross-sectional nature. Moreover, considering the very large sample size of the study, we could not document details on socio-economic background and lifestyle habits of the children under study. The main strengths of the study are its nationwide coverage of all children at school entry, as well as being the first of its kind in the EMR and Middle Eastern countries.

In conclusion, the findings of this nationwide study suggest that our country is observing a shift that signifies a trend towards a more overweight population of youths, and in turn a burden of chronic diseases in the near future. Furthermore, this study highlights the necessity of establishing a surveillance system for monitoring the time-trends of weight disorders and for designing programs to prevent and control the associated factors in an action-oriented manner.

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