

# Prevalence of Overweight and Obesity Among Primary School Children in Iran From 2001-2013: A Systematic Review

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## Abstract

**Background and Aim:** Pediatric obesity and overweight have become worldwide epidemics. Iran is not an exemption in this regard. In the last decade, numerous studies have been conducted in Iran in relation to obesity in children, and an increasing rate of obesity has been reported in the Iranian context. Some of these studies have included an extensive domain covering several provinces, while others have been limited to few cities. In this study, the papers focusing on the prevalence of overweight and obesity in school-aged children in Iran were reviewed.

**Methods:** This study was a systematic review. The key terms “child”, “obesity”, “overweight”, and “Iran” were searched for in PubMed, Scopus, Ovid, ProQuest, and Elsevier databases. Similarly, the key terms’ translations in Persian were searched for in Magiran, Iranmedex, Medlib, and SID. Non-repetitive papers conducted from 2001-2013 holding the key terms in their abstracts, keywords, or main body were extracted and reviewed.

**Results:** A total number of 20 Persian and 11 English papers were reviewed. The overall prevalence rate of obesity in primary-school children in the published literature varied considerably from 1.4% in Zahedan to 17.7% in Ahwaz, and the prevalence rate of overweight from 1.5% in Zahedan to 27.4% in Sari.

**Conclusion:** Overweight and obesity prevalence rates are varied across Iran and high in certain regions – a fact which may be attributed to climatic, racial and temporal characteristics.

**Key Words:** Overweight, Obesity, Child, Schools, Systematic review.

## Introduction

Overweight and obesity are considered as widespread health problems across different societies. In developed countries, its increasing prevalence has attracted attentions since 1960s (1,2). Reports indicate that, unexpectedly enough, obesity and overweight are on the rise in developing countries where malnutrition and low weight are still common problems among children. Obesity and overweight are now rising at a faster rate in developing than developed countries (3-6).

Pediatric obesity is significant for both its physical and psychological health consequences at childhood and its long-term complications. Pediatric obesity correlates positively with adult obesity and its outcomes. World Health Organization (WHO) has estimated that by 2020, non-contagious diseases will account for three-fourths of mortality in the developing countries (1). In the past 2 decades, attractions have shifted towards

cardiovascular and non-contagious diseases in children – risk-factors which have been shown to exist since childhood. Obesity is one of the major risk factors of this type. Childhood obesity is accompanied by increased risks for metabolic syndrome, hypertension, and type 2 diabetes in adolescence. Moreover, an obese child is at a greater chance to become an obese adult. Cardiovascular complications, diabetes and hypertension risks increase at adulthood which, overall, lead to increased risks of adulthood morbidity and mortality (7-9). Obesity and related diseases impose heavy human and economic burdens upon societies.

Iran, like several other developing countries, has experienced a greater prevalence of obesity among children in recent years which is due to immobility and change in lifestyle and nutritional patterns (10-13).

Pediatric obesity is defined by different measures including body net weight, percentages of weight for

height, percentage ideal weight for height, and body mass index (BMI), the latter of which is calculated as the weight in kilograms divided by the height in meters squared ( $\text{kg}/\text{m}^2$ ) (14).

The Centers for Disease Control and Prevention (CDC) proposes BMI as the most appropriate and accessible monitoring measure for obesity (7). BMI is closely related to pediatric obesity outcomes such as hypercholesterolemia, hypertension, and cardiovascular diseases. Based on CDC's definition in 2000, overweight refers to a BMI between 85th–95th percentiles of the BMI-for-age and sex growth charts, while obesity is described as a BMI above 95th percentile (9,15).

In the past 20 years, several studies have been conducted in different regions in Iran concerning the prevalence of pediatric obesity. Some studies have investigated the prevalence of pediatric obesity over years, reporting a rising trend for obesity. Some studies have enquired into the related factors to pediatric obesity. Some have been extensively conducted, covering several provinces.

In a meta-analysis, systematic review, obesity is reported as around 5% among Iranian children (5.3% in boys and 4.8% in girls) (15). In another meta-analysis, systematic review, the statistics were 5.1% and 10.8% among Iranian boys and girls respectively (16).

This systematic review aims to summarize and determine the prevalence of obesity in school-age children in Iran.

## Methods

This systematic review examined the prevalence of overweight and obesity among Iranian school-age children from 2001-2013. The papers under study were published in the Persian and English databases of Magiran (Iranian Magazines and Journals), Iranmedex, Medlib (Iranian Medical Library), SID (Scientific Information Database), PubMed, Scopus, Ovid, ProQuest, and Elsevier. Different search strategies were applied in different databases as they provided different search tools. As for the English databases, a compound search for the key terms "child", "obesity", "overweight", and "Iran" provided all the papers published from 2001-2013, which had these key terms in their abstracts, keywords, or main bodies. To search the Persian papers, "obesity" and "overweight" were looked up separately in the Persian databases for papers published during the same time span. Overall, 2010 papers – 1042 in the Persian databases (344 in Iran Medex; 329 in SID; 175 in Magiran; and 194 in Medlib) and 968 English papers (210 in PubMed; 238 in Scopus, 12 in Elsevier; 498 in Ovid; and 10 in ProQuest) were found at the first stage of investigation. At the next stage, papers that focused on overweight and obesity in school-age children in Iran during the specified time span and that had their full paper available were selected. Repetitive papers as well as case-control and clinical trial papers were eliminated. A graduate in informatics and a specialist performed the search and analysis separately. A checklist covering paper

titles, authors, time and setting of study, sample size, age of subjects, sex, and percentages of overweight and obesity was prepared for final assessment. At the end, 31 papers were included in the current study.

## Results

In this study, 20 Persian and 11 English papers were examined. They were investigated in terms of place of study, year of publication, sample size, and prevalence rates of overweight and obesity. Table 1 summarizes the information from the papers.

The overall prevalence rates of obesity in primary-school children in the published literature varied considerably from 1.4% in Zahedan (43) to 17.7% in Ahwaz (20), and those of overweight from 1.5% in Zahedan (43) to 27.4% in Sari (23). The statistics also differed considerably in terms of sex.

## Discussion

In this section, the results of a number of extensively conducted studies on pediatric overweight and obesity in Iran are discussed:

In Mirmohammadi et al study (47), which was conducted on 29988 children aged 7-18 years of the Persian, Kurd, Lor, Baluch, Turk, and Arab races, the children were compared for BMI and obesity. It was found that Baluchi children had the lowest BMI scores. The highest BMI scores at the age of 8 and 9 years belonged to Arab girls, and to Turk boys at the age of 7 and 11. Obesity and overweight prevalence rates in Mirmohammadi et al study were higher than those in Kelishadi et al study (48). Mirmohammadi et al also reported that the BMI scores of Iranian children and adolescents have increased in the last decade, a fact which, according to him, has resulted from the changing lifestyle along with industrialization, urbanity, reduced physical activity, and increased calories and high-fat food consumption. Kelishadi et al study was conducted in 2008 on 21111 students from 23 provinces aged between 6-18 years showing that rates for pediatric overweight and obesity were 8.82% and 4.5% respectively (48).

In Ziaoddini et al study performed in 2007 on 899035 children entering school (48.8% females; 51.2% males) from 31 provinces in Iran, the prevalence rates of overweight and obesity were, according to CDC standards, 13.5% and 3.5% respectively. In their study, overweight and obesity were more prevalent in big cities and western and northwestern provinces irrespective of sex (49).

In the current study, the prevalence of obesity in Iran was found to be remarkably varied according to the published papers. The highest rates for obesity and overweight were respectively recorded for Sari (27.4% and 12%) (23), girls in Tehran (25% and 13%) (27), Ahvaz (18.8% and 17.7%) (20), and Semnan (18.8% and 14.3%) (29), while the lowest rates belonged to Zahedan in the east of Iran (1.5% and 1.4%) (43). The low rate of obesity belonging

**Table 1.** A Summary of Results From Papers Published on Overweight and Obesity in School-Age Children in Iran

Author(s)	Year	City/Province	Age	Sample Size	Sex	Percentage of Overweight	Percentage of Obesity
Tabesh et al (17)	2012	Ahvaz	7-11	5811	2907 female; 2904 male	19.3 female; 23.6 male	4.5 female; 6.05 male
Taheri et al (13)	2012	Birjand	6-11	1541	851 female; 690 male	9.6	9.2
Ghanbari et al (18)	2010-11	Shiraz	8-12	478	Male	11.9	7.1
Veghari and Rahmati (19)	2010	Golestan province	Primary school-aged	7399	3465 female; 3934 female	8.4	14.1
Aminzadeh et al (20)	2010	Ahvaz	6-10	1594	759 female; 835 male	18.8	17.7
Amanolahi et al (21)	2010	Tehran	Primary school-aged	1040	female	16.54	8.65
Valizadeh et al (22)	2009-10	Tabriz	7-11	1500	female	12.5	5.8
Behzadnia et al (23)	2009-10	Sari	7-12	653	356 female; 297 male	27.4	12
Mojarad and Meybodi (24)	2009	Hamedan	6-11	1000	500 female; 500 male	7.9	11
Maddah et al (25)	2009	Zahedan	7-11	1079	579 female; 500 male	8.9	10.3
Talaie-Zanjani et al (26)	2009	Arak	7-11	742	407 female; 335 male	4	1.7
Azarbaijani et al (27)	2009	Tehran	11	325	female	25.2	13.2
Mirzaei and Karimi (28)	2009	Yazd	6-7	2768	1261 female; 1507 male	6.3	2.4
Nabavi et al (29)	2009	Semnan	7-12	400	193 female; 207 male	18.8	14.3
Ahmadi et al (30)	2009	Kerman	7-11	1566	796 female; 207 male	4.4	9.7
Motlagh et al (31)	2007	Iran	6	862433		12.8	3.4
Motlagh et al (31)	2008		6	782244		13.5	3.5
Motlagh et al (31)	2009		6	955388		10.9	3.4
Salem and Vazirinejad (32)	2008	Rafsanjan	7-11	1275	775 female; 500 male	11.5	9.4
Asadi Noghabi (33)	2008	Bandar Abbas	7-11	1350	689 female; 661 male	11.4	8.5
Madah and Nikooyeh (34)	2006-7	Rasht	6-11	6635	3084 female; 3551 male	15 females; 11.5 males	5.9 females; 5 males
Khodaverdi et al (35)	2007	Tehran	9-11	240	120 female; 120 male	13.8	14.6
Hajian-Tilaki et al (36)	2006	Babol	7-12	1000	550 female; 450 male	12.3	5.8
Haj Salehi et al (37)	2006	Isfahan	7-11	150	female	20.66	2.66
Dorosty et al (38)	2005	Neyshaboor	6-12	1471	822 female; 649 male	Unknown	4.6
Karam Soltani et al (39)	2004-5	Yazd	6-11	3245	1658 female; 1587 male	Unknown	13.3
Soheilifar and Emdadi (40)	2003	Hamedan	6-11	1400	709 female; 691 male	6.4	5.7
Ayatollahi and Mostajabi (41)	2002-4	Shiraz	6.5-11.5	2397	1129 female; 1268 male	3.8 female; 6.8 male	6.1 female; 3.3 male
Mozafari and Nabaiei (42)	2002	Tehran	7-12	1800	female	13.3	7.7
Karajibani et al (43)	2002	Zahedan	7-12	2067	female	1.5	1.4
Taheri (44)	2002	Birjand	7-12	1772	793 female; 979 male	Unknown	4.3 female; 2.5 male
Tabatabaie et al (45)	2002	Ahvaz	6-12	3482	1639 female; 1843 male	6.7	5.2
Aasar and Asghari (46)	2001	Ahvaz	7-14	4793	2500 female; 2293 male	6	2.2

to children in Zahedan is a finding in line with those of Mirmohammadi et al study where the lowest BMI score is reported for Baluch children from among the Iranian races.

In addition to the role of race and geographic, climatic factors on obesity, economic issues can play a role. Sistan and Baluchestan province is an economically underdeveloped region. Poverty and hardly accessible nutritional sources can lead to malnutrition and low weight among the children, preventing the potential ones from obesity. Higher prevalence rates of obesity among children from Sari, Tehran, Ahvaz, and Semnan can result from racial, climatic, and economic characteristics for which Ziaoddini et al reports higher prevalence rates among children from bigger cities.

#### Pediatric Obesity in Other Regions of the World

Pediatric overweight and obesity across some Asian countries are reported as below:

Pediatric obesity in Dhaka, Bangladesh in the 6-9 and 10-13 years age groups were 27.7% and 10.7% respectively (50). Overweight and obesity among 6-8 year-old children in Lebanon were respectively 26% and 5.7% for boys and 25% and 6% for girls (51). The overweight and obesity rates were 11.1% and 7.2% for Chinese 7-14 year-old children (52), 17.9% and 16% for 9-12 year-old children from Kuala Lumpur, Malaysia (53), and 23.1%, 9.3% and 2% for overweight, obesity and severe obesity among Saudi Arabian children and adolescents (54).

The rates for overweight and obesity among Greek children were 25.3% and 5.6% (55) and 15.3% and 17.4% in Argentinian 7-11 year-old children (56) respectively. In Mexican school-age children, the overweight and obesity rates were reported as 18% and 10.8% (57). On the other hand, obesity rates were reported in another study as 41.8% in Mexico, 22.1% in Brazil, 22% in India, and 19.3% in Argentina (3).

Pediatric obesity is very prevalent in developed countries. It is reported to amount to 28% in Canada, 26.9% and 35.7% in Portuguese boys and girls, and 18.7% and 14.1% in Polish boys and girls respectively. Finally, pediatric overweight and obesity rate in the United States in 2009-2010 was reported as 31.8% of which 16.9% (15% female; 18.6% male) were obese (58-61).

#### Prevalence of Obesity and Overweight in the Two Sexes

Overweight and obesity are in a complicated correlation with sex. Overweight and obesity were found to be more prevalent among school-age boys in Tehran, Ahvaz, Birjand in 2012, Golestan province, Babol, Neyshaboor, and the varied Iranian races (11,17,19,36,38,47). However, in studies conducted in Ahvaz by Aminzadeh et al (20), Rasht by Maddah and Nikooyeh (34), and Birjand by Taheri, girls overrode boys in overweight and obesity rates. As for Semnan and Bandar Abbas, boys had a higher rate in obesity, while girls were of a higher rate

in overweight (29,33). In Ayatollahi and Mostajabi study in Shiraz, obesity and overweight were more prevalent among girls and boys respectively (41). In Rafsanjan, overweight was found in girls more than in boys, whereas abdominal obesity was more frequent among boys (32). Finally, the findings from studies conducted in Arak by Talaie-Zanjani et al (26), in Ahvaz by Aasar and Asghari (46), and Kerman by Ahmadi et al (30) indicate that there was no significant difference between the two sexes.

All in All, obesity and overweight are more prevalent among Iranian boys, similar to the situation in Bangladesh, China, and Poland (50,52,59). Further research is required to determine the reason(s) underling the difference between the two sexes. One possible reason may reside from sociocultural conditions in developing, urban areas where boys are more freely exposed to changing lifestyles including fast food consumption and computer games.

#### Comparison of the Prevalence of Obesity According to the Iranian and CDC Standards

In several studies including those by Mirmohammadi et al (47) on Iranian races and the ones conducted in Tehran, Arak, Neyshaboor, and Ahvaz, the prevalence of obesity and overweight determined according to the Iranian and CDC standards are compared. In all of them, the Iranian standard shows a higher prevalence (20,21,26,38). Given the racial and climatic differences in growth criteria, it should be taken into consideration that international standards may underscore pediatric obesity in Iran. This should be cared for when interpreting the results of studies in the literature.

#### Comparison of the Prevalence of Obesity Over Years

In some of the studies, obesity and overweight trends are compared over years. In Esmailzadeh et al study in Tehran and Taheri et al study in Birjand, an increasing trend for both overweight and obesity was reported (11,13). In Ahvaz, overweight and obesity rates were respectively 6% and 2.2% in 2001, 6.7% and 5.2% in 2002, 18.8% and 17.7% in 2010, and 21.5% and 5.2% in 2012 (17,20,46). In Zahedan, the rates for overweight and obesity were respectively reported as 1.5% and 1.4% in 2002, while the rates were 8.9% and 10.3% in 2009 (25,43). The increasing trend of obesity among Iranian adolescents is reported in other studies (1,10,12,13,62). According to Kelishadi's systematic review, pediatric obesity has doubled in Iran from 1993 to 1999 (63).

Similarly, the growing prevalence of pediatric obesity is reported in other countries. In Brazil, it has increased from 4.1% in 1974 to 13.9% in 1997, in Thailand from 12.2% in 1991 to 15.6% in 1993, and in India from 9.8% in 2006 to 11.7% in 2009 (3). In the Japanese children aged 6-14 years, the rate has risen from 5% in 1974 to 10% in 1993 (3). Similar observations are reported concerning pediatric obesity among Greek children (55).

This increasing trend may be the result of changing

lifestyles and nutritional patterns, reduced physical activity because of the replacement of computer games and TV viewing for high-activity games, and consumption of fast food and high-calorie foods.

The pediatric obesity in developed countries, which had increased more rapidly since 1960s, has currently gained a slower rate. There are reports suggesting the stopping or decreasing rate for it. Prevalence of pediatric obesity in the United States has not had any increase from 2007 to 2010 (58). According to a study, pediatric obesity among school-age children in New York has decreased from 21.9% to 20.7% during the time span from 2006-2007 to 2010-2011 (64).

### Conclusion

Overall, overweight and obesity prevalence rates are varied across Iran and high in certain regions. It is essential to devise health policies in this regard including appropriate interventional measures; familiarization of families and children with obesity-inducing factors, consequences, short- and long-term risks, and its morbidity and mortality; corporation of suitable educational programs in school curricula; and modification of lifestyles.

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### References

1. Taheri F, Kazemi T. Prevalence of overweight and obesity in 7 to 18 year-old children in Birjand/Iran. *Iran J Pediatr.* 2009;19(2):135-140.
2. Lopez KN, Knudson JD. Obesity: from the agricultural revolution to the contemporary pediatric epidemic. *Congenit Heart Dis.* 2012;7(2):189-199.
3. Gupta N, Goel K, Shah P, Misra A. Childhood obesity in developing countries: epidemiology, determinants, and prevention. *Endocr Rev.* 2012;33(1):48-70.
4. Taheri F, Hassanzadeh-Taheri MM, Kazemi T, Nazari A, Sharifzadeh G. Prevalence of overweight and obesity in preschool children (2-5 year-olds) in Birjand, Iran. *BMC Res Notes.* 2012;5:529.
5. Weiss R, Dziura J, Burgert TS, et al. Obesity and the metabolic syndrome in children and adolescents. *N Engl J Med.* 2004;350(23):2362-2374.
6. Alwan A. Global status report on noncommunicable diseases 2010. Geneva: World Health Organization; 2011. [http://www.who.int/nmh/publications/ncd\\_report2010/en/](http://www.who.int/nmh/publications/ncd_report2010/en/). Accessed July 2015.
7. Kelishadi R, Cook SR, Motlagh ME, et al. Metabolically obese normal weight and phenotypically obese metabolically normal youths: the CASPIAN Study. *J Am Diet Assoc.* 2008;108(1):82-90.
8. Sinaiko AR, Jacobs DR Jr, Steinberger J, et al. Insulin resistance syndrome in childhood: associations of the euglycemic insulin clamp and fasting insulin with fatness and other risk factors. *J Pediatr.* 2001;139(5):700-707.
9. Skelton JA, Rudolph CD. Overweight and obesity. In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, editors. *Nelson Textbook of Paediatrics.* 18th ed. Philadelphia: WB Saunders; 2007:232-239.
10. Mohammadpour-Ahranjani B, Pallan M, Rashidi A, Adab P. Contributors to childhood obesity in Iran: the views of parents and school staff. *Public Health.* 2014;128(1):83-90.
11. Esmailzadeh A, Mirmiran P, Azadbakht L, Azizi A. Changes in overweight prevalence among Tehrani children and adolescents: comparison of three different definitions. *Razi Journal of Medical Sciences.* 2006;13(52):19-30. [Persian]
12. Mirmiran P, Sherafat-Kazemzadeh R, Jalali-Farahani S, Azizi F. Childhood obesity in the Middle East: a review. *East Mediterr Health J.* 2010;16(9):1009-1017.
13. Taheri F, Kazemi T, Chahkandi T, Namakin K, Zardast M, Bijari B. Prevalence of overweight, obesity and central obesity among elementary school children in Birjand, East of Iran, 2012. *J Res Health Sci.* 2013;13(2):157-161.
14. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. CDC growth charts: United States. *Adv Data.* 2000;(314):1-27.
15. Mirzazadeh A, Sadeghirad B, Haghdoost A, Bahreini F, Rezazadeh Kermani M. The prevalence of obesity in Iran in recent decade; a systematic review and meta-analysis study. *Iran J Public Health.* 2009;38(3):1-11.
16. Kelishadi R, Haghdoost AA, Sadeghirad B, Khajehkazemi R. Trend in the prevalence of obesity and overweight among Iranian children and adolescents: a systematic review and meta-analysis. *Nutrition.* 2014;30(4):393-400.
17. Tabesh H, Hosseiny SM, Kompani F, et al. Prevalence and trend of overweight and obesity among schoolchildren in Ahvaz, Southwest of Iran. *Glob J Health Sci.* 2013;6(2):35-41.
18. Ghanbari H, Nuri R, Moghadasi M, Torkfar A, Mehrabani J. Prevalence of obesity and some associated factors among 8-12 year old boy students in Shiraz. *Iranian Journal of Endocrinology & Metabolism.* 2013;15(1):14-20. [Persian]
19. Veghari G, Rahmati R. The prevalence of obesity in primary schools of golestan province of Iran. *Payavard Salamat.* 2012;5(4):24-31. [Persian]
20. Aminzadeh M, Hosseinzadeh M, Nikfar R, Ghaderian M, Mohsenpourian S. Incidence in overweight and obesity among schoolchildren, Ahvaz-2010. *Jundishapur Scientific Medical Journal.* 2013;12(4):355-361. [Persian]
21. Amanolahi A, Sohrabi MR, Montazeri A, Abadi AR, Kolahi AA. Prevalence of obesity and overweight among female school students. *Payesh (Health Monitor).* 2012;11(1):83-89. [Persian]
22. Valizadeh S, Jabraili M, Ghojzadeh M, Kasraie B. The relationship between leisure activities pattern & body mass index in girl students in elementary schools in Tabriz. *Nursing and Midwifery Journal.* 2010;5(19):54-63. [Persian]
23. Behzadnia S, Vahidshahi K, Hamzeh Hosseini S, Anvari S, Ehteshami S. Obesity and related factors in 7-12 year-old elementary school students during 2009-2010 in Sari, Iran. *Med Glas (Zenica).* 2012;9(1):86-90.
24. Mojarad F, Haeri Maybodi M. Association between dental caries and body mass index among hamedan elementary school children in 2009. *J Dent (Tehran).* 2011;8(4):170-177.
25. Maddah M, Shahraki T, Shahraki M. Underweight and overweight

- among children in Zahedan, south-east Iran. *Public Health Nutr.* 2010;13(10):1519-1521.
26. Talaie-Zanjani A, Faraji F, Mohajerani HR. The study of obesity and overweight in Arak primary school Students, 2009. *Journal of Kermanshah University of Medical Sciences.* 2012;16(2):174-179. [Persian]
  27. Azarbaijani MA, Alipour S, Bakhshandeh H, Rezaeian S, Tojari F. The relation between daily physical activity and obesity in 11-year old girls. *Quarterly Teb Va Tazkieh.* 2009-2010;74-75:19-22. [Persian]
  28. Mirzaei M, Karimi M. Prevalence of overweight and obesity among the first grade primary students in Yazd. *Journal of Ilam University of Medical Sciences.* 2011;18(4):43-49. [Persian]
  29. Nabavi M, Karimi B, Ghorbani R, Mazloom Jafarabadi M, Talebi M. Prevalence of obesity and some related factors among students aged 7 to 12 in semnan (85-86). *Payesh.* 2010;9(4):443-451. [Persian]
  30. Ahmadi E, Tehrani AR, Ahmadi A. Prevalence of obesity, overweight and underweight among elementary school children in southern Iran, 2009. *Am J Appl Sci.* 2010;7(11):1439-1442.
  31. Motlagh ME, Kelishadi R, Ziaoddini H, et al. Secular trends in the national prevalence of overweight and obesity during 2007-2009 in 6-year-old Iranian children. *J Res Med Sci.* 2011;16(8):979-984.
  32. Salem Z, Vazirinejad R. Prevalence of the metabolic syndrome components among 7-11 year-old children in Rafsanjan, 2008. *Iranian Journal of Nutrition Sciences & Food Technology.* 2010;5(2):63-71. [Persian]
  33. Asadi Noghabi F. Prevalence of obesity and overweight among children in Bandar Abbas. *Medical Journal of Hormozgan University.* 2011;15(3):218-226. [Persian]
  34. Maddah M, Nikooyeh B. Factors associated with overweight in children in Rasht, Iran: sex, maternal education, skipping breakfast and parental obesity. *Public Health Nutr.* 2010;13(2):196-200.
  35. Khodaverdi F, Bahram A, Asghari Jafarabadi M. Quality of life, motor ability, and weight status among school-aged children of Tehran. *Iran J Public Health.* 2012;41(6):97-102.
  36. Hajian-Tilaki K, Sajjadi P, Razavi A. Prevalence of overweight and obesity and associated risk factors in urban primary-school children in Babol, Islamic Republic of Iran. *East Mediterr Health J.* 2011;17(2):109-114.
  37. Haj Salehi E, Amidi Mazaheri M, Mirzaei M. Assessment of height, weight and obesity among girls students(7-11 years old) in Isfahan. In: Ghayoor M, ed. *Abstracts 9th Iranian Nutrition Congress Tabriz-Iran.* 2006 September 4-7; Tabriz, Iran. Tehran: Iranian Nutrition Congress; 2006: 134-5. [Persian]
  38. Dorosty AR, Baygi F, Eshraghian MR. Prevalence of obesity among school children in Neishabour (2005). *Journal of Qazvin University of Medical Sciences.* 2008;12(1):73-79. [Persian]
  39. Karam Soltani Z, Dorosty Motlagh AR, Eshraghian MR, Siassi F, Jazayeri A. Obesity and food security in Yazd primary school students. *Tehran Univ Med J.* 2007;65(7):68-76. [Persian]
  40. Soheilifar J, Emdadi M. Relation between breast feeding with overweight and obesity in hamadan primary school children. *Scientific Journal of Hamadan University of Medical Sciences.* 2005;12(2):54-57. [Persian]
  41. Ayatollahi SM, Mostajabi F. Prevalence of obesity among schoolchildren in Iran. *Obes Rev.* 2007;8(4):289-291.
  42. Mozafari H, Nabaei B. Prevalence of obesity and overweight in Tehranian girls' student of primary schools. *Payesh Health Monit.* 2002;1(4):15-9. [Persian]
  43. Karajibani M, Montazerifar F, Mohammadi M, Dashipour AR. The prevalence of obesity and wasting in primary school girls in the city of Zahedan. *Zahedan Journal of Research in Medical Sciences (Tabib-e-Shargh).* 2005;6(4):289-296. [Persian]
  44. Taheri F. Epidemiologic study of obesity in school age children in Birjand. *Journal of Birjand University of Medical Sciences.* 2002-2003;9(1):18-22. [Persian]
  45. Tabatabaie M, Dorosti A, Keshavarz SA, Siasi F, Rahimi R. [Prevalence of underweight, overweight and obesity in primary school children in Ahvaz]. In: Ghayoor M, ed. *Abstracts 9th Iranian Nutrition Congress Tabriz-Iran.* 2006 September 4-7; Tabriz, Iran. Tehran: Iranian Nutrition Congress; 2006: 117. [Persian]
  46. Aasar SA, Asghari S. Prevalence of obesity & overweight among 7-14 year old students in the city of Ahwaz. *Jundishapur Scientific Medical Journal.* 2005;(44):11-20.
  47. Mirmohammadi SJ, Hafezi R, Mehrparvar AH, Rezaeian B, Akbari H. Prevalence of overweight and obesity among Iranian school children in different ethnicities. *Iran J Pediatr.* 2011;21(4):514-520.
  48. Kelishadi R, Ardalan G, Gheiratmand R, et al. Thinness, overweight and obesity in a national sample of Iranian children and adolescents: CASPIAN Study. *Child Care Health Dev.* 2008;34(1):44-54.
  49. Ziaoddini H, Kelishadi R, Kamsari F, Mirmoghtadaee P, Poursafa P. First nationwide survey of prevalence of weight disorders in Iranian children at school entry. *World J Pediatr.* 2010;6(3):223-227.
  50. Mohsin F, Tayyeb S, Baki A, et al. Prevalence of obesity among affluent school children in Dhaka. *Mymensingh Med J.* 2010;19(4):549-554.
  51. Jabre P, Sikias P, Khater-Menassa B, Baddoura R, Awada H. Overweight children in Beirut: prevalence estimates and characteristics. *Child Care Health Dev.* 2005;31(2):159-165.
  52. Liu W, Lin R, Liu A, Du L, Chen Q. Prevalence and association between obesity and metabolic syndrome among Chinese elementary school children: a school-based survey. *BMC Public Health.* 2010;10:780.
  53. Serene TE, Shamarina S, Mohd NM. Familial and socio-environmental predictors of overweight and obesity among primary school children in Selangor and Kuala Lumpur. *Malays J Nutr.* 2011;17(2):151-162.
  54. El Mouzan MI, Foster PJ, Al Herbish AS, et al. Prevalence of overweight and obesity in Saudi children and adolescents. *Ann Saudi Med.* 2010;30(3):203-208.
  55. Krassas G, Tzotzas T, Tsamietis C, Konstantinidis T. Prevalence and trends in overweight and obesity among children and adolescents in Thessaloniki, Greece. *J Pediatr Endocrinol Metab.* 2001;14(suppl 5):1319-1326.
  56. Hirschler V, Calcagno ML, Clemente AM, Aranda C, Gonzalez C. Association between school children's overweight and maternal obesity and perception of their children's weight status. *J Pediatr Endocrinol Metab.* 2008;21(7):641-650.
  57. Vergara-Castañeda A, Castillo-Martínez L, Colín-Ramírez E,

- Orea-Tejeda A. Overweight, obesity, high blood pressure and lifestyle factors among Mexican children and their parents. *Environ Health Prev Med.* 2010;15(6):358-366.
58. Rattue G. Childhood obesity rates in the USA have changed little. *Medical News Today.* 2012. <http://www.medicalnewstoday.com/articles/240391.php/>. Accessed May 4, 2014.
59. Kułaga Z, Litwin M, Tkaczyk M, et al. Polish 2010 growth references for school-aged children and adolescents. *Eur J Pediatr.* 2011;170(5):599-609.
60. Pedrosa C, Correia F, Seabra D, Oliveira BM, Simões-Pereira C, Vaz-de-Almeida MD. Prevalence of overweight and obesity among 7-9-year-old children in Aveiro, Portugal: comparison between IOTF and CDC references. *Public Health Nutr.* 2011;14(1):14-19.
61. Shields M, Tremblay MS. Canadian childhood obesity estimates based on WHO, IOTF and CDC cut-points. *Int J Pediatr Obes.* 2010;5(3):265-273.
62. Taheri F, Kazemi T. Increased prevalence of overweight and obesity in Birjand adolescents aged 15-18 years from 2005 to 2012. *Iran J Pediatr.* 2013;23(6):720-721.
63. Kelishadi R. Childhood overweight, obesity, and the metabolic syndrome in developing countries. *Epidemiol Rev.* 2007;29:62-76.
64. Centers for Disease Control Prevention. Obesity in K-8 students- New York City, 2006-07 to 2010-11 school years. *MMWR Morb Mortal Wkly Rep.* 2011; 60(49):1673-1678.