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The Prevalence of Obesity and Overweight in Iranian Primary School Students: A Systematic Review

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Abstract

Background: Obesity is a critical nutritional issue globally and particularly impacts children's health and well-being. This study investigates the prevalence of obesity and overweight among Iranian primary school students.

Materials and Methods: In this systematic review, a systematic search of online databases (Medline, EMBASE, Scopus, Web of Science, Cochrane Library, CIVILICA, SID, Magiran, and Google Scholar) was conducted for related studies with no time limit up to February 2022 using relevant MeSH keywords. Two reviewers evaluated the quality of eligible studies and carried out the selection procedure.

Results: The prevalence of obesity and overweight in primary school children was 14.3% (range: 3.1-25.9%) and 18.8% (range: 5.5-32%), respectively, although these ranges seem to be incorrectly stated as they imply a maximum value equal to or less than the reported prevalence; typically, ranges should encompass the reported figure as a midpoint or minimum rather than maximum. Obesity and overweight were more prevalent in primary students from Semnan and less prevalent in students from Tabriz. Based on the results, there was a significant relationship between being overweight/obese in students and factors such as age, gender, birth weight, school type, snacking habits, walking time to school, family size, parental education level, father's occupation, parental obesity status, physical activity levels, and family income ($p < 0.05$).

Conclusion: This study reveals that obesity and overweight affect 14.3% and 18.8% of primary school students, respectively. Given these findings, implementing targeted educational interventions at both school and family levels is crucial to prevent and reduce the prevalence of obesity among children.

Key Words: Iran, Primary school, Prevalence, Obesity, Overweight, Students.

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1- INTRODUCTION

The Centers for Disease Control and Prevention (CDC) defines a body mass index (BMI) as follows: less than the 5th percentile for age and gender is categorized as underweight, between the 5th and less than the 85th percentile as healthy weight, between the 85th and less than the 95th percentile as overweight, and at or above the 95th percentile as obese (1). Today, the increasing prevalence of overweight in children is one of the most critical public health problems globally, affecting both developed and developing countries, leading to various complications in childhood and adulthood (2-3). Findings indicate that weight gain among children and adolescents in some regions may be higher compared to global averages; however, specific data on Middle Eastern countries versus other developing countries was not provided. Since 1998, Iran has been reported by various sources to have significant concerns regarding childhood obesity within its region (4-6).

Studies in Iran have shown varying prevalence rates of obesity among children and adolescents (7-14). Many obese children are likely to remain obese as adults (15). Obesity is a well-established risk factor for numerous health problems, including hypertension, diabetes (16, 17), hyperlipidemia (18), certain cancers (19), liver disease (20, 21), gallstones (22), respiratory issues (23), osteoarthritis, and infertility in women (24, 25), as well as psychological issues like depression and low self-esteem (2). Furthermore, childhood obesity can lead to adverse social and economic outcomes, such as lower educational attainment, reduced income, and social marginalization (26, 27). Given the increasing prevalence of obesity among children and adolescents and the serious consequences that extend into adulthood, and considering that intervention is most effective between the ages of 7 and 12 (28), this study aims to determine the prevalence of obesity and overweight among Iranian primary school students.

2- MATERIALS AND METHODS

The Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist was used as the template for this review (29).

2-1. Eligibility Criteria

Participants, Interventions, Comparators, and Outcomes (PICO) was used to formulate the review objective and inclusion criteria.

2-1-1. Participants: Iranian primary school students (aged 7-12 years old).

2-1-2. Interventions: The included research are non-interventional studies; therefore, we did not have an intervention.

2-1-3. Comparison: We did not have a comparison group since this review includes non-interventional studies.

2-1-4. Outcome: Obesity and overweight.

2-2. Included studies

The review included studies containing any form of quantitative assessment, measurement, and evaluation of overweight and obesity in primary school students in Iran. The inclusion criteria focused on studies that: exclusively examined overweight or obesity among primary school students; were published up to February 2022; were written in English or Persian; and used the Body Mass Index (BMI) index exclusively (30). BMI, a measure of obesity based on weight and gender according to Centers for Disease Control and Prevention (CDC) (31) and International Obesity Task Force (IOTF) (32) indices, was used in most studies (33). This measure was chosen due to its simplicity and the non-invasive nature of anthropometric measurements in

determining overweight and obesity in children.

2-3. Exclusion criteria

The exclusion criteria were: abstracts without the full article; studies on high school students; use of diagnostic instruments other than the BMI index; studies using CDC 2000 or the International Obesity Task Force (IOTF) 2000 growth charts if not used in conjunction with the current CDC or IOTF; articles not written in English or Persian; review articles; meta-analyses; letters to the editor; editorials; short reports; case reports; and briefs.

2-4. Information sources

A systematic search of electronic databases (Medline, EMBASE, Scopus, Web of Science, Cochrane Library, CIVILICA, SID, Magiran, and Google Scholar search engine) was conducted. The search was done independently and in duplicate by two reviewers, and any disagreement between the reviewers was resolved by the supervisor.

2-5. Search

Search terms included a combination of (Students OR Primary school students OR Elementary students) AND (Obesity OR Overweight) AND (Prevalence) AND (Iran).

2-6. Study selection

The process for study selection involved several steps: database searches for potential studies, screening of abstracts to identify eligible studies, retrieval and assessment of full-text articles, and creation of a final list of included studies. This process was conducted independently and in duplicate by two reviewers, with any disagreements resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

2-7. Data collection process

A researcher-developed data extraction form was used for each study. This form included the author's name, study year, location, gender, age, sample size, and prevalence of obesity and overweight in participants. Two reviewers independently collected the data using this form. The collected data were then compared for accuracy, and any discrepancies were resolved by a third reviewer.

2-8. Risk of bias in individual studies

The risk of bias was assessed using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (34). STROBE is a valuable tool for evaluating the quality of observational studies. This checklist contains 22 items, scored based on the importance of each item to the present study. The final possible score of the checklist was 30, and the minimum acceptable score for inclusion was 15. The assessment was performed independently and in duplicate by two reviewers, and any discrepancies were resolved by a third reviewer.

2-9. Synthesis of results

Given the variability in study designs, age groups, and sample sizes across the included studies, a meta-analysis was not conducted.

2-10. Ethical considerations

Ethical approval was not required as the study analyzed only publicly available data, in accordance with established guidelines. The research adhered to ethical standards by rigorously respecting copyright laws and ensuring transparency in methods and data sources.

3- RESULTS

A final selection of 12 studies, encompassing 16,745 primary school students across 18 cities or territories in Iran, was made based on a systematic review of online databases up to February

2022 (**Figure 1**). These studies investigated the prevalence of overweight and obesity in Iranian primary school children. The prevalence of obesity was 14.3% (range: 3.1-14.3%), and the prevalence of overweight was 18.8% (range: 5.5-18.8%). Key characteristics of these studies are summarized in **Table 1** and discussed below:

Table-1: General characteristics of included studies.

Author, Year, (Reference)	City/ Province	Gender	Age, year	Sample size	Prevalence (%)	
					Overweight	Obese
Shahgholian et al., 2002, (35)	Chaharmahal and Bakhtiari	boy/girl	7-12	2,772	-	9.9
Hajian et al., 2006, (36)	Babol	boy/girl	7-12	1,000	12.3	5.8
Farrin et al., 2012-2013, (37)	Tabriz	boy/girl	6-11	857	7.4	2.1
Khorramabadi et al., 2011-2012, (38)	Khorramabad	boy/girl	6-14	3,387	16.7	4.8
Noghabi et al., 2008, (39)	Bandar Abbas	boy/girl	7-11	1,350	10.9	6.2
Azarbayjani et al., 2010-2011, (40)	Tehran	girl	7-11	488	19	14
MotamedRezaei et al., 2014, (41)	Birjand	boy	10-14	270	10	5.6
Habibi et al., 2013-2014, (42)	Sanandaj	boy/girl	7-12	614	13.2	9.8
Nabavi et al., 2010, (43)	Semnan	boy/girl	7-12	400	18.8	14.3
Solki et al., 2010-2011, (44)	Shahryar	boy/girl	6-12	325	11.7	7.1
Tabatabaei et al., 2002, (45)	Ahwaz	boy/girl	6-12	3,482	-	CDC: 5.2 LOTF: 3.6
Mozafary et al., 2002, (46)	Tehran	girl	7-12	1,800	13.3	7.7

CDC: The Centers for Disease Control and Prevention, LOTF: The International Obesity Task Force.

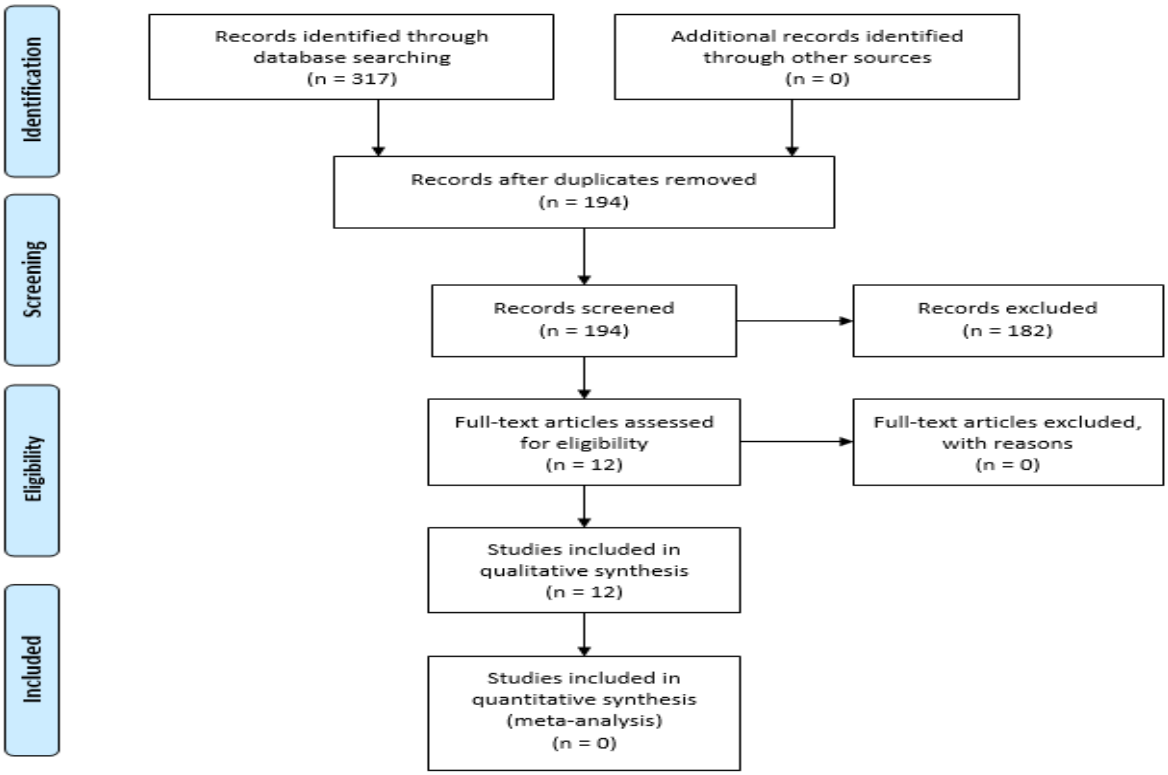

Fig.1: PRISMA flowchart.

1. In 2002, a two-stage study of 2772 primary school boys and girls in Chaharmahal and Bakhtiari province aimed to determine the 90th percentile of BMI and identify risk factors for obesity in primary school children. The study found a 9.9% prevalence of obesity among the students, with parental and first-degree relative obesity, specific food consumption patterns, and mean birth weight in girls showing a significant relationship with obesity (35).

2. A cross-sectional study conducted in 2006 on 1,000 primary school students in Babol found that the prevalence of underweight, overweight, and obesity was approximately one-seventh (13.5%), one-eighth (12.3%), and about six percent (5.8%), respectively. The risk of being overweight or obese increased with higher parental literacy levels, whereas underweight was more prevalent among students attending public schools. Additionally, increased physical activity during leisure time was significantly associated with reduced odds of overweight and obesity (36).

3. A cross-sectional study was conducted on 857 primary school students in Tabriz from 2012 to 2013 to determine BMI in primary school boys and girls. The results showed that, based on BMI data, the prevalence of underweight, overweight, and obesity among male students was 20.9%, 5.5%, and 3.1%, respectively; among female students, it was 18.8%, 9.7%, and 0.9%; and overall, it was 20.1%, 7.4%, and 2.1%. Overweight was more prevalent in female students (9.7%) than in males (5.5%). However, the prevalence of obesity in male students was approximately three times higher than in female students ($p<0.05$) (37).

4. A cross-sectional study involving 3,387 students aged 6 to 14 in Khorramabad from 2011 to 2012 aimed to determine factors contributing to obesity and overweight among these students. The results revealed a significant relationship between overweight and obesity in students and factors such as school type, family size, parental education level, and family income ($p<0.05$). Obesity and overweight were more prevalent among students attending private schools and those from higher-income families. Additionally, overweight and obesity were more common among students whose parents had higher levels of education (38).

5. A cross-sectional study was conducted on 1,350 students (689 girls and 661 boys) aged 7 to 11 years in Bandar Abbas in 2008, aiming to estimate the prevalence of overweight and obesity among children. The results indicated that the prevalence of overweight was 12.8% among girls and 10% among boys, while obesity rates were 6.2% for girls and 10.9% for boys. Obesity was significantly associated with gender, father's occupation, parents' education level, and school type ($p<0.05$) (39).

6. A descriptive study involving 488 elementary students aged between 7 and 11 years in northern Tehran during the period from 2010 to 2011 aimed to explore the relationship between obesity, physical activity, and socioeconomic status specifically among girl students. The findings revealed that approximately one-fifth (19%) of these primary school girls were overweight, while about one-seventh (14%) were obese. There was a significant negative correlation between BMI and physical activity levels ($p<0.05$), as well as a significant positive correlation between socioeconomic status and BMI ($p<0.05$) (40).

7. A cross-sectional study was conducted in 2014 on 270 boys in the fourth, fifth, and sixth grades of primary schools in Birjand. The study aimed to determine the prevalence of obesity and its relationship with food habits among these students.

The results indicated that 10% of the students were overweight, while 5.6% were obese. There was a significant positive correlation between body mass index (BMI) and daily intake of bread and cereals (r=0.17, p=0.006), milk (r=0.21, p=0.001), and meat substitutes (r=0.24, p<0.05). Additionally, significant relationships were found between BMI and student age (r=0.13, p=0.037), mothers' educational level (p=0.038), and fathers' occupation (p=0.018) (41).

8. A descriptive-analytic study involving 614 students aged between 7 and 12 years at schools in Sanandaj from 2013 to 2014 aimed to investigate the epidemiology of obesity and overweight among this population group. The findings revealed that obesity prevalence was approximately one-tenth (9·8%) of these students, while about one-eighth were overweight at a rate of approximately thirteen percent (13·2%). There was a significant association between being overweight or obese with factors such as gender, father's educational level, and breakfast consumption habits (p<0·05) (42).

9. A cross-sectional study involving 400 first- to fifth-grade students examined the prevalence of obesity among children aged 7 to 12 in Semnan in 2010. The results indicated that approximately one-seventh (14.3%) of the students were obese, and nearly one-fifth (18.8%) were overweight. There was a significant association between gender and obesity, with boys being more likely to be obese and girls more likely to be overweight. Additionally, for each year increase in age, the risk of obesity increased by a factor of 1.26. Furthermore, there was a statistically significant relationship between parental obesity and child obesity; for every unit increase in maternal BMI, the risk of child obesity increased by a factor of 1.18, while for paternal BMI it increased by a factor of 1.15 (43).

10. A cross-sectional study involving 325 elementary students aged 6 to 12 in Shahryar during 2010–2011 aimed to determine the prevalence of obesity and its relationship with anthropometric measures and lifestyle factors. The results showed that the mean daily energy intake in obese children was 2381.74 ± 308.95 kcal, compared to 1564.52 ± 160.57 kcal in healthy-weight children (p < 0.05). Multiple logistic regression analysis revealed a significant relationship between daily energy intake, duration of nighttime sleep, meals consumed during passive physical activity, and the father’s body mass index (BMI) with overweight and obesity (p < 0.001). However, no significant relationships were found regarding age, gender, leisure-time activities, or birth order among participants in this age group (44).

11. A cross-sectional study involving 3,482 students aged 6 to 12 years (1,843 boys and 1,639 girls) in Ahwaz primary schools in 2002 aimed to determine the prevalence of obesity using three baseline values: IOTF, CDC 2000, and local Iranian data. The results indicated that the prevalence of obesity based on Iranian reference data was approximately one-tenth (10.9%), while it was about one-twentieth (5.2%) according to CDC standards and roughly one-thirtieth (3.6%) based on IOTF criteria (45).

12. A cross-sectional study involving 1,800 female primary school students in Tehran in 2002 investigated the prevalence of obesity and its related factors among children. The results showed that the overall prevalence of obesity was approximately one-tenth (7.7%), while overweightness affected about one-seventh (13.3%) of these students. There was also a statistically significant relationship between obesity and factors such as age, walking time to school, students' self-perceived appearance, and their mental perception of themselves (46).

4- DISCUSSION

This study examined the prevalence of overweight and obesity among primary school students and identified factors influencing these conditions. A review of existing studies revealed that the prevalence rates for obesity and overweight in primary school children were approximately 14.3% (ranging from 3.1% to 14.3%) and 18.8% (ranging from 5.5% to 18.8%), respectively. There was a significant association between being overweight or obese and several factors, including student age, gender, birth weight, school type, snack consumption habits, walking time to school, family size, parental education level, father's occupation, parental obesity status, physical activity levels, and family income ($p<0·05$).

The spread of urbanization and industrialization in societies, coupled with the replacement of physical labor by machines, has significantly reduced natural human activity. Sedentary behavior is a major consequence of modern life and disrupts normal bodily functions. This issue is particularly pronounced for children due to living in apartments and a lack of accessible sports facilities for physical activity. Consequently, this inactivity and reduction in motor activities have contributed to increased rates of overweightness and obesity among children (47).

The significant increase in the prevalence of obesity and overweight among children and adolescents has drawn considerable attention. Obesity is now a global issue affecting many developed and developing countries. Millions of dollars from the budgets and resources of countries and families are spent annually on reducing obesity prevalence and treating related diseases. Regular physical activity and a healthy diet are crucial for preventing obesity and overweight. Research indicates that obese adolescents tend to have fewer friends and spend less free time with friends (26, 48).

Evidence suggests that childhood obesity and overweight are multifactorial conditions caused by a combination of genetic and environmental factors. Risk factors such as economic conditions, dietary patterns, and physical activity are known contributors (49). Environmental factors include access to high-fat foods, reliance on ready-to-eat meals, decreased physical activity due to increased screen time, overeating, parental obesity (especially maternal obesity), and parents' levels of education, nutritional behaviors, and eating habits. Economic and social influences, along with the child's exposure to diseases such as asthma, further increase the risk of childhood obesity (50, 51). Supportive social networks and physical environments—such as access to physical activity equipment and stores—can effectively limit or enhance the impact of determinants like diet and physical activity in obese children (52).

These figures indicate that physical activity is an effective preventive measure and should be prioritized in schools. This issue has often been overlooked due to economic factors and safety concerns. Berkowitz states that neglecting appropriate physical activity in schools contributes to obesity, and its prevention requires collaboration between parents and schools (53). Educating parents about childhood obesity and informing them about energy balance can be beneficial. A study in the United States demonstrated that communicating children's weight status through health report cards and providing relevant data are effective strategies for managing obesity and overweight among children (54). Promoting a healthy culture and encouraging physical activities such as walking, using public transportation, riding bicycles, skating, or scootering, along with ensuring safety, can enhance mobility and

increase students' physical activity levels (55). The most serious consequences of overweight and obesity in children and adolescents include an increased risk of obesity, diabetes, cardiovascular diseases, and certain cancers in adulthood (4). With approximately 18.8% of children in the country classified as overweight and 14.3% as obese, it is essential to develop and implement a national program aimed at preventing and controlling these issues.

4-1. Study Limitations

One of the limitations of this study was the existence of different criteria for defining obesity and overweight.
One limitation of this study was the variation in criteria used to define obesity and overweight, which may have affected the consistency and comparability of the findings.

5- CONCLUSION

The results showed a significant relationship between overweight and obesity in students and their age, gender (obesity was higher in boys, while overweight was more prevalent in girls), birth weight, school type (private schools), snacking habits, walking time to school, family size, parental education level, father's occupation, parental obesity status, physical activity level, and family income ($p < 0.05$). Obesity and overweight were more prevalent among students attending private schools and coming from families with higher incomes. The prevalence of overweight and obesity was also higher among students whose parents had a higher education level. Multiple logistic regression analysis revealed that daily energy intake, duration of nighttime sleep, meals consumed during passive physical activities, and the father's body mass index all had a significant association with overweight and obesity ($p < 0.001$). The findings indicated a significant positive correlation between BMI and daily intakes of bread/cereals, milk and meat substitutes.

6- CONFLICT OF INTEREST: None.

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