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Breakfast and Snack Patterns among Iranian Children and Adolescents: A Systematic Review

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Abstract

Background: Breakfast is often considered the most important meal of the day; however, many children and adolescents regularly skip this morning meal. This study aims to investigate breakfast and snack consumption patterns, as well as the factors influencing these behaviors among primary and high school students in Iran.

Materials and Methods: In this systematic review, two independent researchers selected articles that reported on the status of breakfast and snacks among students from the Scopus, EMBASE, Cochrane Library, Web of Science, CINAHL, Medline, CIVILICA databases, and the Google Scholar search engine, without any time restrictions up to December 2022.

Results: A total of 21 studies involving 45,778 children and adolescents were included. The results indicated that 20.75% (9.3–32.2) of school children and 17.09% (2.1–32.08) of high school students skipped breakfast. Additionally, 54.1% (10.5–97.7) of children and 55.05% (17.3–92.8) of adolescents reported consuming breakfast regularly. Midmorning snack intake was observed in 55.35% (13–97.7) of children and 72.4% (48.6–96.2) of adolescents. The primary reasons for skipping breakfast included low appetite, waking up late, unappetizing foods, and lack of attention from mothers. A significant relationship was found between snack consumption and various factors, including maternal age, maternal educational level, gender, urban residency, and the students' birth order ($p < 0.045$). An inverse relationship was identified between students' age and economic situation and breakfast consumption ($p = 0.01$, $r = -0.143$).

Conclusion: Breakfast skipping and snack consumption were common among children and adolescents. The primary reasons for missing breakfast included low appetite, waking up late in the morning, unappetizing foods, and a lack of attention from mothers. It is essential to develop school health promotion programs for parents and students to encourage healthy eating habits, including nutritious breakfasts and snacks.

Key Words: Adolescents, Breakfast, Children, Iran, Snack.

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1- INTRODUCTION

Breakfast, typically eaten in the morning, is the first meal of the day (1). The term refers to breaking the fasting period of the previous night (2). Various "typical" or "traditional" breakfast menus exist, with food choices varying across regions and cultures worldwide. Nutrition is an essential factor in promoting and maintaining health, and it varies depending on the activity levels of children and adolescents. Childhood and adolescence are critical periods for developing lifelong nutritional habits (3, 4).

Nutrition, particularly through breakfast, plays a crucial role in the health and academic success of students. Skipping breakfast is associated with decreased accuracy, reduced mental concentration, and increased academic failure. Missing this meal can lead to a decline in the nutrients available to the brain and, ultimately, a decrease in cognitive function (5). A study conducted in the country indicates that approximately 40% of children do not eat breakfast (4), despite it being recognized as the most important meal of the day, with regular consumption positively impacting physical, mental, and social health. This essential meal is more frequently overlooked by children and teenagers than by other age groups (6, 7).

The rate of skipping breakfast varies across populations (8). Children and adolescents who skip breakfast tend to have poorer nutrient intakes than those who do not (9-11). Eating a regular breakfast has been linked to a greater intake of fiber, calcium, iron, vitamin C, and other nutrients, as well as a lower intake of fat, cholesterol, and sodium (12-14). Breakfast skipping among children and adolescents is associated with several negative health outcomes and health-compromising behaviors, including higher blood cholesterol and insulin levels, smoking, alcohol use, physical inactivity, disordered eating, and unhealthy weight management practices (15-20). When students miss a healthy morning meal, they go to class hungry. Hunger is associated with lower physical activity, stomachaches, headaches, depression, anxiety, and a decreased ability to focus (21). Additionally, children and adolescents experiencing hunger tend to have lower math scores and generally poorer grades and are more likely to fail a grade (22, 23).

Studies show that students with inadequate appetite and limited opportunities to eat breakfast are more irritable in the classroom and show reduced interest in learning due to fatigue and lack of energy (24, 25), often resorting to snacks at school to satisfy their hunger. High consumption of low-nutritional-value foods among children and adolescents has consequences such as obesity, tooth decay, and chronic diseases (26). Proper nutrition and the appropriateness of school food programs are essential for maintaining the health of children, especially during school age, due to their greater vulnerability, significant representation in the population, and the increased effectiveness of health interventions in this period (27, 28).

Based on the above, good nutrition—especially through breakfast—is a crucial factor in human progress within society. The state of nutrition and health serves as an indicator of social well-being (4). Inadequate nutrition hinders the growth of children and adolescents, contributes to the spread of diseases, diminishes physical and intellectual capacity, and can lead to conditions such as depression among students (5). Therefore, in alignment with government policies aimed at improving nutrition among target groups, particularly students, it is essential for healthcare providers to understand the eating patterns of children and adolescents and the reasons for skipping breakfast during school (6). However, statistics vary across different regions of the country, and there is a lack

of comprehensive reviews of studies that determine the prevalence of breakfast consumption and the reasons for its omission among various age groups of students (3). This study aims to investigate and review breakfast and snack consumption patterns, along with their influencing factors, among primary and high school students in Iran.

2- MATERIALS AND METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was used as the framework for this review (29).

2-1. Eligibility criteria

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

- **Participants**: Iranian primary and high school students aged 6 to 19 years.
- **Interventions**: The included studies were non-interventional; therefore, there was no intervention group.
- **Comparison**: No comparison group was included in the studies.
- **Outcome**: Breakfast consumption and skipping, as well as snack consumption.

2-2. Included Studies

The review included studies that contained any form of quantitative assessment, measurement, and evaluation of breakfast consumption and skipping, as well as snack consumption, specifically among primary and high school students in Iran. These studies were published up to December 2022 and were written in English or Persian.

2-3. Exclusion Criteria

The exclusion criteria included abstracts without full articles, articles not written in English or Persian, review articles, systematic reviews and meta-analyses, letters to the editor, editorials, short reports, case reports, and briefs.

2-4. Information Sources

A systematic search of electronic databases, including Medline (via PubMed), Scopus, EMBASE, Web of Science, Cochrane Library, CINAHL, CIVILICA, and Google Scholar, was conducted. The search was performed independently by two reviewers, and any disagreements between the reviewers were resolved by the supervisor.

2-5. Search

The titles and abstracts of the identified records were initially screened for relevance. If an article could not be definitively rejected based on its title or abstract, the full-text paper was retrieved for further evaluation. Keywords were obtained from MeSH and extracted from related articles. The search terms included a combination of "students," "primary school children," "elementary students," "high school students," "breakfast consumption," "breakfast skipping," "snack," "snack consumption," "junk food," and "Iran."

2-6. Study selection

A database search was conducted to identify potential studies. Abstracts were screened for eligibility, full-text articles were obtained and assessed, and a final list of included studies was compiled. In addition to primary articles, the references of these articles were also searched for additional studies. This process was carried out 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

From each of the included studies, the following information was recorded in the data extraction table: author's name, year

of study, study design, study population, city or province of the study, gender, and main results.

2-8. Risk of bias in individual studies

The risk of bias was assessed using the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines (30). STROBE is a valuable tool for evaluating the quality of observational studies. This checklist consists of 22 items, each scored based on its relevance to the present study. The maximum score for the checklist was 30, while the minimum score was 15.0. The assessment was conducted independently and in duplicate by two reviewers, with any discrepancies resolved by a third reviewer.

2-9. Synthesis of results

A meta-analysis was not conducted due to significant differences among the included studies, such as variations in study design (descriptive-analytical, cross-sectional, secondary studies), age groups, sample sizes (ranging from 100 to over 14,000 participants), and the types of questionnaires used. These inconsistencies in methodology and data collection make it challenging to combine the results into a single, reliable analysis.

2-10. Ethics statement

Ethical approval was not required for this study because it is a systematic review that does not involve direct human or animal subjects.

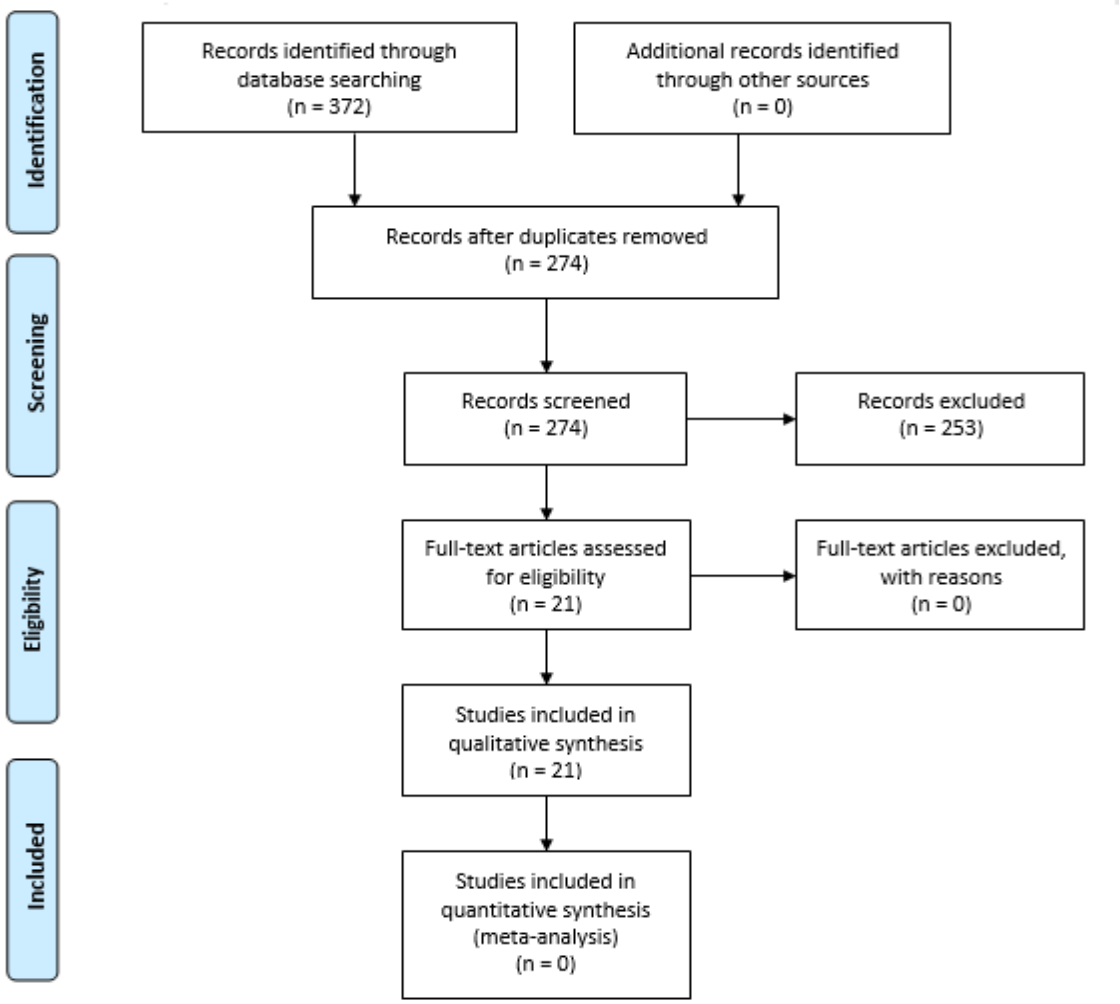

Fig.1: PRISMA Flowchart.

3- RESULTS

At the conclusion of the search process, 21 relevant studies were selected, encompassing a total of 45,778 children and adolescents. This group included 10,599 schoolchildren and 35,179 high school students (**Figure 1**). The main characteristics of the selected studies are summarized in **Table 1** and are as follows:

1. A descriptive study conducted in 2012 involving 223 fourth-grade elementary students in Zahedan aimed to assess their knowledge and perceived threat levels regarding breakfast and snack consumption. The results indicated that 51.6% of the students ate breakfast every day, while 22% reported consuming snacks daily. The Pearson correlation test revealed a significant positive relationship between knowledge and perceived susceptibility and severity, as well as behavior ($p < 0.05$) (31).

2. A descriptive-analytical study conducted in 2014 with 180 elementary students in Torbat Heydariyeh aimed to evaluate the levels of knowledge, perceived benefits, and barriers related to breakfast and snack consumption. The results showed that 45.6% of the students had breakfast every day, 10.4% went to school without breakfast, and only 22.5% consumed snacks daily. The Pearson correlation test demonstrated a significant positive relationship between knowledge, behavior, perceived susceptibility, and severity; however, no such relationship was found between perceived benefits and behavior (32).

3. A descriptive-analytical study conducted from 2007 to 2008 involving 1,300 primary school students in Qazvin aimed to investigate the patterns of breakfast and snack consumption, as well as the factors influencing these behaviors. The results indicated that 89.5% of the students had breakfast before going to school. The most common reason for skipping breakfast was waking up late in the morning. Additionally, 85.4% of the students consumed bread and cheese, while only 20.1% included milk in their breakfast. Only 8.5% of students did not eat any snacks during school hours, with cakes and cookies being the most frequently consumed snacks (85.1%) among them (33).

4. A descriptive-analytic cross-sectional study conducted in 2017 aimed to investigate the factors affecting breakfast consumption among 312 elementary school students in Esfarayen. The results showed that 97.7% of the students consumed breakfast an average of 6.11 ± 1.3 days per week. Most students preferred to have breakfast with their families (86.5%), and 80.8% enjoyed having breakfast at home. The most commonly consumed food group was bread and grapes (50.5%), while fruits were the least consumed (5.5%). The study found a significant correlation between protein consumption at breakfast and daily breakfast consumption ($p < 0.05$, $r = 0.112$) (34).

5. A cross-sectional study conducted from 2013 to 2014 involving 245 students from eight elementary schools in Gonbad aimed to assess snack patterns and associated factors among elementary school students. The results indicated that 97.7% of the students consumed snacks, with biscuits, cakes, and cookies being the most popular choices (49%). A significant relationship was found between snack consumption and maternal age ($p < 0.045$), maternal educational level ($p < 0.001$), and the birth order of the students ($p < 0.045$) (35).

6. A cross-sectional study conducted in 2017 involving 360 primary school students aimed to investigate breakfast consumption behavior, self-efficacy, outcome expectations, outcome evaluation, and knowledge among elementary students. The results indicated that the mean weekly breakfast consumption score

was 2.4, with a standard deviation of 1.7. Only 10.5% of the students had breakfast daily. There was a significant relationship between breakfast consumption and self-efficacy, outcome expectations, and outcome evaluation ($p < 0.001$). An inverse relationship was found between students' age, economic situation, and breakfast consumption ($p = 0.01$, $r = -0.143$). Multiple regression analysis revealed a significant relationship between self-efficacy, type of school, student age, and breakfast consumption, predicting a variance of 24.3% in breakfast consumption (36).

7. A descriptive study conducted in 2012 involving 7,426 students from urban and rural areas aimed to evaluate the effects of skipping breakfast among primary school children in northern Iran. The results indicated that 91.7% of schoolchildren had breakfast before going to school. Skipping breakfast was reported by 9.3% of students (9.9% female and 6.7% male), but it was significantly less common ($p = 0.001$) in the Turkman ethnic group (6.0%) compared to other ethnic groups such as Fars (9.6%) and Sistani (9.4%). The most important reasons for missing breakfast were low appetite (70.1%), unappetizing foods (11.8%), lack of attention from mothers (5.2%), and other factors (13%). Additionally, higher educational levels of parents, good income, and unemployed fathers were identified as significant risk factors for skipping breakfast among schoolchildren in this region (37).

8. A cross-sectional study conducted in 2016 involving 298 primary school children in Ilam City aimed to assess breakfast consumption patterns among a sample of primary students. The results indicated that 32.2% of the schoolchildren skipped breakfast, with 5% of these students never having breakfast at all. There was a significant difference in breakfast habits between boys and girls ($p < 0.05$). Additionally, it was found that 13.1% of the schoolchildren had not eaten anything for breakfast the morning before completing the questionnaire (38).

9. A cross-sectional study conducted in 2015 involving 155 primary school girls in Omidieh, Khuzestan province, aimed to evaluate the breakfast and snack patterns of these students. The results indicated a satisfactory breakfast consumption pattern within the studied population, with 79.5% of students reporting that they regularly ate breakfast during the 14 days of the study. Additionally, 22% of students consumed junk food, including puffs, chips, and candy, while 13% opted for traditional snacks such as dried fruits and nuts. The primary reason for not eating breakfast among 49% of students was a lack of appetite. Regarding breakfast types, 28% of the students consumed bread, cheese, and tea, while 12% chose traditional foods. Only 2.5% consumed bread, cheese, and walnuts (39).

10. A case-control study conducted from 2010 to 2011 involving 100 girls from primary schools in Tehran aimed to evaluate the association between educational achievement and breakfast and snack consumption among primary school children. In the study, 50 children with scores lower than 17 were randomly selected as the case group, while 50 children with scores higher than 17 constituted the control group. The results indicated a statistically significant difference ($p < 0.05$) between the two groups in terms of breakfast consumption. In the case group, 22% of participants reported that they typically had breakfast, whereas this figure was 80% in the control group. There was also a significant difference ($p < 0.0001$) between the two groups regarding daily snack consumption. Among participants in the control group, 72% typically consumed snacks, while 54% of the case group reported normally having snacks. This indicates that children in the case group consumed fewer

breakfasts and snacks compared to those in the control group ($p < 0.05$) (40).

11. A cross-sectional study involving 2,444 students aged 12-14 from five Iranian ethnicities (Arab, Kurdish, Sistani, Baluchi, Turkish, and Turkmen) aimed to determine the status of breakfast and snack consumption among these students in 2015. The results showed that the mean number of food types available at home for breakfast was 2.2, while the mean amount of snacks consumed at school was 1.8. A total of 17.3% of the students did not have breakfast at home, and 16.2% did not consume any food at school. The least frequently consumed nutritional content group was fruits and vegetables, while the highest nutritional intake came from the miscellaneous group. The quality of 16% of the food received was rated as poor. There was a significant relationship between the quantity and quality of foods consumed and the ethnic groups ($p < 0.05$) (41).

12. A descriptive study conducted in 2008 involving 120 female students aimed to determine the knowledge, attitudes, and nutritional practices of middle school students in District Four of Isfahan. The results indicated that 37.5% of students had poor nutritional knowledge, and 90% exhibited poor nutritional practices. Daily consumption of bread and cereals was higher than that of other food groups; however, the average consumption of milk and dairy products, meat, fruits, and vegetables was lower than the minimum recommended levels for this age group. The most commonly consumed snacks were fruits, cakes, and biscuits (42).

13. A descriptive-analytical study conducted from 2009 to 2010 involving 100 secondary school girls aimed to determine breakfast consumption and its predictors among schoolgirl students in Qom, based on the constructs of Pender's health promotion model. The results indicated that only 25% of the studied students had breakfast seven days a week, while 21% went to school without eating breakfast. Based on the constructs of Pender's model and personal factors that potentially correlate with behavior, a 69% variability in breakfast consumption among the girls ($R^2 = 0.69$, $F = 12.68$, $p < 0.0001$) was predicted by the following variables: prior related behaviors, perceived barriers, self-efficacy, and competing demands and preferences (43).

14. A cross-sectional descriptive-analytical study involving 208 governmental middle school students conducted in 2013 aimed to determine dietary patterns and breakfast and snack consumption among middle school students in Ramsar. The results showed that the main food group consumption of most participants (56.2%) was unsatisfactory; 92.8% ate breakfast at home, and 96.2% had snacks at school. Participants consistently consumed milk and dairy products (34.1%), meat (10.6%), eggs (13.9%), vegetables (17.4%), and fruits (34.1%). There was a significant relationship between sex and the frequency of milk, meat, and egg consumption ($p<0.05$) (3).

15. A cross-sectional study aimed to determine the patterns of food consumption and physical activity among 450 high school students in North Khorasan province. The results indicated that the prevalence of obesity was higher in girls than in boys. Up to 60.2% of boys and 38.6% of girls in the morning shift, as well as 64.5% of boys and 47.4% of girls in the evening shift, had breakfast during weekdays (44).

16. A secondary study was conducted on 13,486 students (mean age 12.50 ± 3.36 years) across 30 provinces of Iran during 2011-2012. Data were obtained from the fourth national school-based surveillance survey, "CASPIAN-IV," which aimed to assess the frequency of consuming different types of snacks among Iranian students according to the socioeconomic

status (SES) of their living regions. The results indicated that fresh fruits were the most commonly consumed category of healthy snacks (55.74%). Boys had a higher daily consumption of milk (48.65% vs. 43.27%), while girls had a greater daily consumption of fresh fruits (58.07% vs. 53.47%). Urban residents had lower consumption of vegetables (30.53% vs. 37.55%), dried fruits (18.29% vs. 23.02%), and fresh fruits (45.33% vs. 50.09%) compared to their rural counterparts. Among unhealthy snacks, sweets had the highest daily consumption (34.15%). Boys consumed more sweetened beverages (22.57% vs. 17.6%) and fast foods (3.51% vs. 2.17%). At the national level, the consumption of other junk snacks (except for salty snacks, which were consumed by 16.24% of rural residents vs. 11.83% of urban residents) showed no significant difference between urban and rural populations (45).

17. A study conducted as part of an epidemiological survey involving 2,302 schoolgirls in Guilan Province (2005-2006) aimed to evaluate the current status of overweight and obesity among high school girls in both urban and rural areas. The results indicated that a significant percentage of the students surveyed, particularly those who were overweight or obese, skipped breakfast in both urban and rural settings. Additionally, the consumption of energy-dense, low-nutrient snack foods was prevalent during school hours among both overweight/obese and normal-weight girls, especially in rural areas. School buffets provided the majority of food consumed throughout the school day, particularly in rural regions (46).

18. A cross-sectional study involving 569 students aged 12 to 16 years in Yazd (2020) aimed to estimate and compare the intake of macro- and micronutrients in breakfast and mid-morning snacks. The results showed that the prevalence of irregular breakfast consumption was 61.9% among the students. Adolescents with irregular breakfasts reported a higher daily energy intake. Additionally, 85.6% of the adolescents consumed mid-morning snacks. Notably, 96.3% of the students had their breakfast prepared at home. Energy intake from breakfast was significantly higher in males ($p < 0.05$). The adjusted mean intake of total carbohydrates, total fat, saturated fat, fat-soluble vitamins, vitamin B complex, vitamin C, and caffeine during breakfast was significantly greater among male students ($p < 0.05$). Regarding mid-morning snacks, boys consumed significantly higher adjusted mean amounts of total carbohydrates, protein, saturated fat, vitamin C, zinc, calcium, and iron compared to girls (47).

19. A national cross-sectional study was conducted involving 14,880 students with a mean age of 12.47 ± 3.36 years, selected through a multistage cluster sampling method from rural and urban areas across 30 provinces of Iran (2016-2017). The study aimed to assess the relationship between snack consumption and meal skipping among Iranian children and adolescents. The results indicated that 32.08%, 8.89%, and 10.90% of the studied population skipped breakfast, lunch, or dinner, respectively. The frequency of meal skipping was higher among girls, urban residents, and students in higher school grades ($p < 0.05$) (48).

20. A cross-sectional study with descriptive-analytic aspects was conducted on 300 high school students to assess the relationship between eating breakfast and snacks with awareness levels in students of a high school in Tehran. The results showed that 72.6% of students had breakfast every day, and only 2.1% went to school without it. A total of 64.6% ate snacks every day. There was no correlation between having breakfast and attention in classes, but math scores were correlated with having breakfast ($p = 0.045$, $r=0.107$). There was a significant relationship

between eating breakfast and body mass index ($p < 0.05$) (49).

21. A cross-sectional study involving 320 students from public high schools in Yazd (2013) aimed to investigate their nutritional and health behaviors. The results showed that 18% of students did not always eat breakfast, and 48% consumed carbonated soft drinks at least once a day. More than 64% of students had consumed prepared foods at least once in the previous seven days (50).

Table-1: The general characteristics of included studies (n=21).

Author, Year, Reference	Study design	Study population	Study city/province	Gender	Main results
Lotfi et al., 2012, (31)	Descriptive study	223 elementary students	Zahedan	Male/Female	51.6% of students reported eating breakfast every day, and 22% reported consuming snacks every day.
Alizadeh Siuki et al., 2014, (32)	Descriptive-analytical study	180 elementary students	Torbat-Heydariyeh	Male/Female	45.6% of students ate breakfast every day, 10.4% went to school without breakfast, and only 22.5% ate snacks every day.
Rezakhani et al., 2007-2008, (33)	Descriptive-analytical study	1300 elementary students	Qazvin	Male/Female	89.5% of students had eaten breakfast before going to school.
Rohani et al., 2018, (34)	Descriptive-analytic cross-sectional study	312 elementary students	Esfarayen	Male/Female	97.7% of students consumed breakfast and reported an average of 6.11 ± 1.3 days of breakfast per week.
Abedi et al., 2013-2014, (35)	Cross-sectional study	245 elementary students	Gonbad	Male/Female	97.7% of students consumed snacks.
Sadr Hashemi et al., 2017, (36)	Cross-sectional study	360 elementary students	Isfahan	Male/Female	Only 10.5% of students were eating breakfast daily; mean breakfast consumption was 2.4 days/week (SD = 1.7).
Veghari et al., 2012, (37)	Descriptive study	7426 elementary students	North of Iran	Male/Female	91.7% of school children ate breakfast; skipping breakfast was significant among 9.3% of students.
Mirzaei et al., 2016, (38)	Cross-sectional study	298 elementary students	Ilam	Male/Female	32.2% of schoolchildren skipped breakfast; significant difference between boys' and girls' habits ($p<0.05$).
Karimi et al., 2015, (39)	Cross-sectional study	155 elementary students	Omidieh	Female	79.5% reported regularly eating breakfast; additionally, 22% consumed junk foods and 13% traditional snacks.
Nazari Nasab et al., 2010-2011, (40)	Case-Control study	100 elementary students	Tehran	Female	Only 22% in the case group reported eating breakfast compared to 80% in the control group.
Motlagh et al., 2015, (41)	Cross-sectional study	2444 high school students	Iran	Male/Female	Mean food types at home for breakfast was 2.2; mean snacks at school was 1.8; significant percentages skipped meals.
Hazaveheei et al., 2008, (42)	Descriptive study	120 high school students	Isfahan	Female	Found that 37.5% had poor nutritional knowledge; and that 90% had poor nutritional practice.
Rahimi et al., 2009-2010, (43)	Descriptive-analytical study	100 high school students	Qom	Female	25% of the studied students ate breakfast 7 days a week, while 21% went to school without eating breakfast.
Karimi et al., 2013, (3)	Cross-sectional descriptive analytical study	208 high school students	Ramsar	Male/Female	92.8% of the samples ate breakfast at home, and 96.2% had a snack at school.
Hosseini et al., 2011, (44)	Cross-sectional study	450 high school students	North Khorasan	Male/Female	Up to 60.2% of boys and 64.5% of girls in the morning shift, as well as

			province		38.6% of boys and 47.4% of girls in the evening shift, eat breakfast during the weekdays.
Bahreynian et al., 2011-2012, (45)	Secondary study	13,486 students (mean age 12.50 ± 3.36 years)	30 provinces of Iran	Male/Female	Among unhealthy snacks, sweets had the highest daily consumption, while fresh fruits were the most commonly consumed category of healthy snacks. Boys consumed milk more frequently, whereas girls consumed fresh fruits more often.
Maddah et al., 2005-2006, (46)	Secondary study	2,302 high school students	Guilan province	Female	A high percentage of the students in the study, especially those who were overweight or obese, skipped breakfast in both urban and rural areas.
Karandish et al., 2020, (47)	Cross-sectional study	569 high school students	Yazd	Male/Female	The prevalence of irregular breakfast eating was 61.9% among the students, and midmorning snack intake was reported by 85.6% of adolescents.
Kelishadi et al., 2016-2017, (48)	Cross-sectional study	14,880 students (mean age 12.47 ± 3.36 years)	30 provinces of Iran	Male/Female	32.08%, 8.89%, and 10.90% of participants skipped breakfast, lunch, and dinner, respectively.
Jafari et al., 2013, (49)	Cross-sectional study	300 high school students	Tehran	Male/Female	72.6% of students eat breakfast every day, while only 2.1% go to school without it; additionally, 64.6% eat snacks every day.
Shahbazi et al., 2013, (50)	Cross-sectional study	320 high school students	Yazd	Male/Female	18% of students do not always eat breakfast; also, 48% consume carbonated soft drinks at least once a day.

4- DISCUSSION

Students are the future builders of society and are in one of the most important periods of development. As food patterns are formed in the early years of life, especially during childhood and adolescence, and become stabilized over time, this period is the most appropriate time to identify nutritional problems and improve the existing situation. Childhood and adolescence play a crucial role in determining dietary habits in adulthood. This study aimed to investigate and review the patterns of breakfast and snack consumption and their influencing factors among primary and high school students in Iran. The systematic review demonstrated that 20.75% of schoolchildren and 17.09% of high school students skipped breakfast. Mid-morning snack intake was reported among 55.35% of children and 72.4% of adolescents. A significant relationship was found between snack consumption and maternal age, maternal educational level, and the birth order of the students. Additionally, there was an inverse relationship between students' age, economic situation, and breakfast consumption ($p = 0.01$, $r = -0.143$).

Students form a large part of society. The student population in Iran is close to 13 million, and their physical and mental health are essential for a dynamic and healthy society (51-54). Childhood and adolescence are two crucial periods in the formation of nutritional habits throughout life (3, 55, 56). Nutrition, especially through breakfast, is a significant factor in the health and academic success of students; thus, not eating breakfast is associated with decreased accuracy, mental concentration, and academic failure (57-68). Nutritionists divide meals into three main parts: breakfast, lunch, dinner, and two or three snacks. Among these, breakfast is essential as it increases metabolism in the morning and compensates for the decreased blood

glucose levels in the brain after a night's sleep. Furthermore, as most intellectual activity occurs in the early hours of the day, breakfast should include foods that can provide one-third of the total daily energy requirement (27, 28, 69). However, the results of the present review indicated that 20.75% (9.3-32.2%) and 17.09% (2.1-32.08%) of schoolchildren and high school students skipped breakfast, respectively. The frequency of meal skipping was higher among girls, urban inhabitants, and schoolchildren.

Studies show that going to school hungry and without breakfast leads to distraction, neglect of natural stimuli, and lower levels of active behavior in children. Breakfast is the most important daily meal due to its calming effect at the beginning of the day, its ability to relieve hunger in body cells—especially brain cells—regulate blood sugar, and have direct effects on body weight (27, 28, 70). Children experiencing hunger may have lower physical functioning, more frequent stomachaches and headaches, mental health problems (e.g., depression, anxiety, behavioral issues), and poorer overall health (71-76). The study by Zamani et al. showed that students aged 6 to 18 years had unfavorable nutritional behaviors, with 51% of children consuming various types of puffs, industrial juices, carbonated drinks, candies, chocolates, and junk food as snacks during the week (77). Studies indicate that students who skip breakfast generally have slower memory recall, make more errors, and are more likely to be absent or late and to repeat a grade (78-80).

In the present review, the primary reasons for missing breakfast were low appetite, waking up late, unpalatable foods, and inattentive mothers. In addition, higher parental education levels, good socioeconomic conditions, and unemployed fathers were among the most important risk factors for breakfast skipping by schoolchildren in this region. Snacks play an important role in learning and concentration. Around noon, even children who have eaten breakfast become hungry, and the concentration necessary for learning diminishes. Thus, consuming the right snack can increase students' work capacity and learning ability. However, the snack consumed must have sufficient nutritional value, be satisfying and healthy, and fit within the family's budget. When choosing a suitable snack, in addition to the student's interest and appetite, it is necessary to consider the nutrients required for growth and health, as well as the family's economic status, ensuring that the snack does not decrease the child's appetite to the point that they skip main meals (81). Such healthy snacks include fresh fruits, fresh vegetables, natural juices, nuts (e.g., walnuts, pistachios, almonds, hazelnuts), and biscuits (28, 82-85). These snacks provide about 38% of the students’ daily energy intake, with fruits and plain biscuits being the most commonly consumed items. Other studies have reported that the snack consumption rates in urban and rural areas of the country were 20.3% and 25.8% for puffs and chips, 21.5% and 27.2% for carbonated drinks, and 30.8% and 33.2% for chocolate and sweets, respectively (86, 87).

Based on the current review, fresh fruits (55.7%), biscuits, cakes, and cookies were the most frequently consumed snacks, accounting for 49%. Among unhealthy snacks, sweets had the highest daily consumption at 34.15%. Boys had a higher consumption of sweetened beverages (22.57% vs. 17.6%) and fast foods (3.51% vs. 2.17%) compared to girls.

In general, students who eat breakfast have better vitamin and nutrient intake, enjoy overall healthier diets, and are less prone to being overweight or obese. Regularly eating breakfast has been linked with a greater intake of fiber, calcium, iron,

vitamin C, and other vitamins and minerals, and a lower intake of fat, cholesterol, and sodium (12-14). Children and adolescents who eat breakfast have more favorable weight-related outcomes (e.g., lower body mass index, lower waist circumference, decreased likelihood of being chronically obese, and decreased obesity risk) in the short and long term than those who skip breakfast (10, 13, 87-93). In addition to breakfast frequency and composition, other factors such as dinner quality, healthy back-to-school habits, physical activity, and socioeconomic status (SES) are also effective for adolescents (46). Nutrition, especially through breakfast and snacks, plays an essential role in students' health and academic performance. Schools are an effective platform for plans and policies to prevent bad eating habits, as students spend much of their time at school. It is necessary to improve the nutritional status of students through education and nutritional awareness, and by using nutritional support strategies such as providing snacks in schools supplemented with nutrients like iron and zinc. Attention to proper nutrition and higher nutritional awareness among students and families to choose healthier foods can be effective in improving their physical health and academic success (27, 28, 65).

5- CONCLUSION

Students should start the school day with a healthy breakfast. Breakfast is often referred to as the most important meal of the day, as it provides sustenance and energy (i.e., calories) for the activities ahead. Based on the results, mid-morning snack intake was reported among 55.35% (13-97.7%) of children and 72.4% (48.6-96.2%) of adolescents. The most significant reasons for missing breakfast were low appetite, waking up late in the morning, unpalatable foods, and inattentive mothers. There was an inverse relationship between students' age, economic situation, and breakfast consumption. Schools should conduct health promotion programs for parents and students to encourage healthy breakfast and snack consumption.

6- CONFLICT OF INTEREST: None.

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