

Regularity in Breakfast and Snacks Intake and Its Relationship with Weight Status in Elementary School Students: A Cross Sectional Study

Fariba Hosseinzadegan¹, Masoumeh Hemmati Maslak Pak², Farideh Namadi³, Davoud Vahabzadeh⁴

¹ Assistant Professor of Nursing, Department of Nursing, Urmia University of Medical Sciences, Urmia, Iran.

² Professor of Nursing, Maternal and Child Obesity Research Center, Urmia University of Medical Sciences, Urmia, Iran.

³ PhD Candidate in Nursing, Department of Nursing, Urmia University of Medical Sciences, Urmia, Iran.

⁴ Assistant Professor, Non Communicable Disease Research Center, Ilam University of Medical Sciences, Ilam, Iran.

Abstract

Background: Childhood weight status is one of the important predictors of health status later in life. Some previous studies have postulated a relationship between the pattern of breakfast intake and weight status, but this relationship has not yet been clearly confirmed. This study aimed to assess the status of regularity in intake of breakfast and snacks and its relationship with weight status in elementary school students.

Method: This study was done with a descriptive-analytic design. 362 children (Males: 192, Females: 170 child) were selected from elementary schools of Urmia by the use of stratified cluster sampling. A dietary 24-hour recall form was used for the assessment of intakes. Data about breakfast, snacks, height, weight, and waist circumferences were collected. Children's Physical Activity Questionnaire (PAQ-C) was used to assess the participants' physical activity level. Data were analyzed using the descriptive and inferential statistics in SPSS software.

Results: Mean student age, weight and BMI were 10.57 ± 1.17 years, 37.44 ± 11.30 kg and 18.4 ± 3.39 , respectively. 53.2% of girls had a regular breakfast and 55% regular snack intake. Among the boys, 46.8% had regular breakfast and 45% regular snack intake. Results showed a significant relationship between BMI and snacks consumption ($p = 0.02$). There was a significant relationship between the frequency of irregular breakfast intake and weight ($P=0.01$), but the relationship was not significant for the body mass index ($P = 0.11$). 58.1% of the students in the irregular breakfast group and 64.4% of those in the irregular snacks group were lean.

Conclusions: Regular intake of snacks was correlated with higher weight status and maintaining desirable BMI. Irregular breakfast intake was related to lower weight. Most students with irregular breakfast and snack intake were underweight and thin.

Key Words: Elementary school, BMI, Breakfast, Obesity, Overweight, Snacks.

* Please cite this article as: Hosseinzadegan F, Hemmati Maslak M, Namadi F, Vahabzadeh D. Regularity in Breakfast and Snacks Intake and Its Relationship with Weight Status in Elementary School Students: A Cross Sectional Study. Int J Pediatr 2023; 11 (03):17477-17486. DOI: **10.22038/ijp.2023.69856.5152**

*Corresponding Author:

Davoud Vahabzadeh, Assistant Professor, Non Communicable Disease Research Center, Ilam University of Medical Sciences, Ilam, Iran. Email: vahabzadeh-d@medilam.ac.ir

Received date: Dec.30,2022; Accepted date:Feb.28,2023

1- INTRODUCTION

Childhood obesity is a serious public health problem in developed countries, as well as in developing countries (1). According to the World Health Organization (WHO), the global prevalence of obesity has risen from 31 million to 42 million children (2). In Iran, the results of studies have shown that the prevalence of obesity in children aged 6-12 is about 7-16% (3). The results of a study by Haeri et al. showed that the prevalence of obesity in children at the time of entering primary school based on CDC, WHO, IOTF and Iranian references is 6.2%, 6.9%, 3.8% and 6.9%, respectively (4). Overweight and obesity in children is associated with short and long-term health side effects. In the short term, they have risks such as low self-esteem, negative mental imaginary, hyperlipidemia, high blood pressure, and hyperinsulinemia compared to non-obese children; and in the long term, obesity is a risk factor for many diseases, such as certain cancers, high blood pressure, diabetes mellitus, metabolic syndrome and cardiovascular diseases (5, 6). Overweight in early childhood will be more likely to be transferred to adulthood, so it can increase the risk of chronic complications associated with being overweight (7). This leads to a reduction in effective labor forces, an increase in health care costs, and a reduction in the productivity of the population (8, 9). This relationship is stronger among children over 10 years old (10). Although the direct cause of weight gain is a generally positive energy balance, the cause of obesity is different. Changes in food habits and lifestyles, genetic, social and cultural factors have been introduced as important factors (11). Among the individual causes of obesity, daily dietary patterns include the number and frequency of meals and their distribution during the day are noteworthy (12). For example, an increase in the number of snacks per day

has been reported to be an important factor in increasing overweight among such children (13). A limited number of studies have been done in regard to the use of snacks in Iranian elementary children. Their results indicate an inappropriate pattern of snacks and high consumption of low nutritional quality snacks (14, 15). One of the nutritional behaviors that have been reported to be effective in the health status of school-age children is the status of breakfast intake. Regular breakfast intake, especially among children, as appropriate nutritional behavior, not only helps provide the energy needed for the starting activities, but also has been postulated to be able to prevent overweight and obesity and has been directly related to the improvement in cognitive functions (16, 17). Despite the perceived benefits of breakfast, it has often been removed from the daily menus or in some instances consumed at a negligible amount (18). Hoyland et al. reported that 14 percent of children aged 7- 15 years old spent their breakfast time ineffectively, and one-third had never eaten meals until lunch (19). Such children will be exposed to negative health consequences as a result of lacking breakfast intake (6). Some studies support the reverse relationship between breakfast intake and the status of weight, reporting that breakfast is associated with lower body mass index (BMI) (16, 20), although some others such as the one by Lumene reject this inverse relationship (21). A meta-analysis study shows that the results of studies conducted in this area have coincided with biases. So yet, the status of the relationship between the regularity of breakfast and weight is still unknown (22). Considering such contradictions in the results of studies and differences in climatic and cultural status of different regions, the present study was conducted to assess the status of regularity in intake of breakfast and snacks and its relationship with weight status among elementary school students in west Azerbaijan, Iran.

2- MATERIALS & METHODS

2-1. Subjects and study design:

In this descriptive-analytical study, 362 male and female students were selected from the elementary schools of Urmia, in 2018. The sample was selected via stratified cluster method from areas with different socioeconomic status and all the six grades of elementary school (23, 24). After obtaining a consent from the deputy of research and ethics committee of Urmia University of Medical Sciences, random selection of schools was done from three different subarea, with considering the type of schools and the following inclusion criteria: Living in Urmia, being in public or private school, being in girls' or boys' school, having consent for participation, being in the age range of 6 to 12 years, not going on a special diet, and lack of any congenital disorders or disabilities.

2-2. Measures and dietary assessments

The breakfast and snacks assessment form, 24 h dietary recall, were completed by a trained interviewer for each student, individually. The demographic data were recorded immediately after height and weight measurement. Then, questions about the status of breakfast consumption were asked. Breakfast intake was recalled for 7 days not consecutive days. At the same time, data was gathered on the time of meals, type and amount of consumed foods in breakfast and daily snacks. In some instances, the student's mother was also interviewed for verifying the results. A child with a seven-day consecutive intake of breakfast and 21 snacks during a week was considered as a child with regular intake. Food variety score was computed based on the number of consumed servings from each dietary group. If all prescribed numbers of servings were consumed during the day, one score recorded, and finally the earned scores were summed. Those with lower

numbers of consumed servings received lower scores. Weight and height were measured using a Seca® scale (Seca® 725; GmbH & Co., Hamburg, Germany) with a stadiometer, with participants wearing light clothes and no shoes. Weight and height were measured to the nearest 100 g and 0.5 cm. The percentiles for girls and boys were calculated with sex-specific CDCs. Overweight was defined as BMIs equal to or more than the 85th percentile and below the 95th percentile. Obesity was defined as BMIs equal to or more than the 95th percentile. Children with BMIs equal or less than 5th percentile were considered lean or thin (25, 26). Physical activity was assessed using the physical activity questionnaire (PAQ-C). This questionnaire consists of 9 questions, measuring the physical activity level. Its validity and reliability have been reported to be high in Iran and some other countries (27, 28). Using this questionnaire, the activities of each child, in the last 7 days of the week, were evaluated.

2-3. Data Analysis

All data were entered in SPSS version 21 and analyzed by appropriate statistical tests. For descriptive statistics, mean, standard deviation, percentage, and frequency were reported. To analyze the quantitative data, independent t-test, analysis of variance, correlation and regression were used; and for qualitative data, Chi-square and Fisher exact test were applied. The level of significance was considered as 0.05.

3- RESULTS

362 children (192 males and 170 females) were included in the current study. Among girls, 53.2% had a regular breakfast and 55% regular snacks intake, while 46.8% of boys were in the regular breakfast group and 45% in the group of regular snacks intake. In public schools, the percentage of students with regular breakfast was higher, while in

nongovernmental schools, the number and percentage of snacks intake was higher. Chi-square test showed that there was no significant difference between the regular and irregular breakfast group in terms of

qualitative variables such as sex (p=0.06), school type (p=0.44) and school grade (p=0.68) (**Table 1**).

Table-1: Comparing child's demographic properties between regular and irregular breakfast and snacks intake groups

Variables	Subgroups	Regular breakfast intake group	Irregular breakfast intake group	P Value	Regular snacks intake group	Irregular snacks intake group	P Value
Quantitative Variables							
Age (M±SD)	All	10.55±1.17	10.61±1.20	0.70	10.73±1.08	10.48±1.22	0.402*
Height (M±SD)	All	141.52±9.19	141.36±9.7	0.88	141.84±8.58	141.28±9.71	0.572*
Weight (M±SD)	All	37.23±10.95	38.05±12.28	0.57	38.90±11.71	36.64±10.00	0.072*
Waist Circumference (M±SD)	All	69.36±9.19	71.26±9.96	0.1	70.72±9.46	69.37±9.38	0.192*
BMI (M±SD)	All	18.3±3.77	18.67±4.23	0.46	19.02±4.07	18.05±3.76	0.022*
Physical Activity Score (M±SD)	All	2.46±0.60	2.44±0.74	0.81	2.45±0.67	2.45±0.62	0.922*
Qualitative Variables							
Sex N (%)	Female	143 (53.2)	39 (41.9)	0.06	71 (55)	111 (47.6)	0.17**
	Male	126 (46.8)	54 (58.1)		58 (45)	122 (52.4)	
School N (%)	Public	157 (58.4)	50 (53.8)	0.44	56 (43.4)	151 (64.8)	<0.001**
	Private	112 (41.6)	43 (46.2)		73 (56.6)	82 (35.2)	
Class No N (%)	2th	1 (0.4)	1 (1.1)	0.68	0 (0)	2(0.9)	0.001**
	3th	67 (24.8)	22 (23.7)		18 (14)	71 (30.5)	
	4th	54 (20.1)	14 (15.1)		35 (27.1)	33 (14.2)	
	5th	86 (32)	35 (37.6)		41 (31.8)	80 (34.3)	
	6th	61 (22.7)	21 (22.6)		35 (27.1)	47 (20.2)	

* Independent sample t-test

** Chi square

Similarly, there was no significant difference in the sex variable between the regular and irregular snacks intake groups (p=0.17). Non-governmental and public schools had 56.6% and 43.4% regular snacks intakes, respectively. Among the grades, the fifth (31.8%) and the third grades (14%) had the highest and lowest regular snacks intakes, respectively.

The average age of students in the regular breakfast group was 10.55 ± 1.17 years and in the irregular breakfast group, it was 10.61 ± 1.207 years (p=0.7). The mean weight in the irregular breakfast group was 38.05 ± 12.86 kg and in the regular breakfast group was 37.23 ± 10.95, respectively, which was not significantly different between the two groups (p=0.57).

The mean age of the students in the regular snacks group was 10.73 ± 1.08 years, while in irregular snacks group was 10.48 ± 1.22 , which were significantly different ($p=0.04$).

Independent sample t-test showed no significant difference between the two groups of regular and irregular breakfast intake in terms of quantitative variables such as age, height, weight, waist circumference, body mass index, and physical activity score ($p=0.81$). Furthermore, there was no significant difference between the two groups of regular and irregular snacks intake in terms of quantitative variables such as height, weight, waist circumference, physical activity score ($p=0.92$). However, they were significantly different in body mass index ($p=0.04$, $p=0.02$, respectively) (**Table 1**).

Most of the children in the study were thin (60.5%), 31% had a normal weight, 7.7% were overweight, and about 1% were obese. The average body mass index of students in the regular breakfast group was 18.30 ± 3.77 and in the irregular breakfast group was 18.67 ± 4.23 kg / m². In the regular snacks consumption group, the mean BMI was 19.02 ± 4.07 and in the irregular consumption group this amount was 18.05 ± 3.76 kg / m². There was a significant relationship between BMI and the status of snacks consumption ($p=0.02$). 8.6% of students in the group of irregular breakfast intake and 5.6% in the group of irregular snacks intake were overweight. 58.1% of the participants in the irregular breakfast group and 64.4% of those in the group of the irregular snacks intake were lean (**Table 2**).

Table-2: Comparison the status of weight, breakfast and snacks regularity consumption between groups

Variable		Breakfast		P value	Snacks		P value
		Regular N (%)	Irregular N (%)		Regular N (%)	Irregular N (%)	
Weight status	Thin	165 (61.3)	54 (58.1)	0.84 *	69 (53.5)	150 (64.4)	0.09 *
	Normal	83 (30.9)	30 (32.2)		44 (34.1)	69 (29.6)	
	Overweight	20 (7.4)	8 (8.6)		15 (11.6)	13 (5.6)	
	Obese	1 (0.4)	1 (1.1)		1 (0.8)	1 (0.4)	
Breakfast and snacks status N (%)		93 (25.7)	269 (74.3)	<0.001**	129 (35.6)	233 (64.4)	<0.001**

* Chi Square test

** Mann Whitney Test

Weight was significantly correlated with the number and frequency of irregular breakfast ($p=0.01$), but this relationship was not significant for body mass index ($p=0.11$). The results of Pearson

correlation test, further, revealed that the diversity of breakfast foods within the week days was not significantly correlated with body weight and body mass index ($P=>0.05$) (**Table 3**).

Table-3: Correlation table for the number and variety of breakfast and snacks consumption with weight and body mass index

Variable	Correlation and P value	The number of irregular breakfast intake	The number of irregular snacks intake	Food variety score for breakfast on the first day	Food variety score for breakfast on the Day 2	Food variety score for breakfast on the Day3
Weight	R value	-0.24	-0.02	-0.08	-0.1	0.00
	P value	0.01	0.71	0.12	0.05	0.96
BMI	R Value	-0.16	-0.04	-0.04	-0.09	0.04
	P value	0.11	0.76	0.43	0.08	0.37

4- DISCUSSION

According to the results of this study, almost half of female (53.2%) and male students (46.8%) had regular breakfast intake. Body mass index of students did not show a significant relationship with regular breakfast intake; however, it was significantly correlated with snacks consumption. Moreover, the results revealed no significant correlation between food variety in breakfast and body mass index. Regular consumption of breakfast and snacks were not also found to have significant relationships with weight. To justify this finding, it should be noted that although among the individual causes of obesity, daily dietary patterns include the number and frequency of meals and their distribution during the day are noteworthy (12), food habits and lifestyles, genetic, social and cultural factors are also effective (11). For example, an increase in the number of snacks per day has been reported to be an important factor in increasing overweight, by increasing the total daily calorie intake. Intake of a good and well programmed breakfast can prevent and reduce the desires of subjects for consuming inappropriate snacks that are high in sugar and fat.

In line with the results of the present study, Jeans and et al. found no significant relationship between breakfast consumption and metabolic or

anthropometric parameters in low-income Hispanic children (29). Similarly, Delvarianzadeh et al. (18), reported that among school children in Shahroud, almost half of the studied students had 56.8% of breakfast haven. In some previous studies body weight has been found to be correlated with eating breakfast and so breakfast is considered as one of the most important daily meals (16, 20). In the study by Rahimi et al., (30) 25% of the studied students had breakfast intake for 7 continuous days during a week. In another study by Doostan et al., 28.4% of the students were taking breakfast every day, and 12% of them went to school without breakfast (31). The differences between studies can be due to differences in access to food staples, lifestyle changes, and differences in nutritional patterns, socioeconomic status, ecological conditions, sampling methods and forms of reporting the results. The results from this study showed that the students in non-governmental schools have more regular snacks intakes in comparison to those in public schools and this is higher in the fifth grade compared to others. It can be possibly attributed to the small number of students, more and better care in nongovernmental schools, and higher social and economic conditions of the parents in such schools. In the current study, students with regular snack consumption patterns were found to have

more desirable weights than those with irregular snack intakes. So, the student's body mass index had a meaningful relationship with snack intake regularity. In the same line, Doostan et al. (31), reported a significant correlation between morning snacks intake and body mass index. Unlike, in Hanson's study on young girls, no significant relationship was found between snacks consumption and body mass index (32).

In our study, 8.6% of students in the group of irregular breakfast intake and 5.6% in the irregular snacks intake group were overweight. The percentage of students' obesity was very low. 58.1% of students in the irregular breakfast group and 64.4% of students in the irregular snacks group were lean. Status of breakfast intake did not lead to any significant difference in body mass index. Likewise, in the study by Doostan et al. (31), 18.9% of students were overweight and 13.8% were obese, however, there was no significant difference in the amount of overweight and obesity among students with and without breakfast intake in their study. The results of another study by Ahadi et al, (33) suggest that regular breakfast consumption is significantly associated with lower body fat and healthier eating habits. Therefore, yet more studies in interventional and controlled designs are needed to determine the causality relationship.

In contrast to the results of the present study, Smetanina et al. (34) have reported a significant direct correlation between reduced breakfast intake and obesity. In Shakeri and his colleagues' survey (35) on 810 female secondary school students in the age range of 12-16 years, a significant relationship between obesity and nutritional behaviors was indicated. The review of literature by Blondin et al., has also shown that the results of different studies indicate that breakfast has a positive effect on preventing overweight in children and adolescents (36).

In the present study, the number and frequency of irregular breakfast intake were significantly correlated with weight status, but not with body mass index. Moreover, the number and frequency of irregular snacks in our study were not correlated with weight and body mass index significantly. In the same line, Maffeis et al. (37), regarding the relationship between snacks and overweight in children, reported that the average energy intake from consumed foods in snacks in obese and overweight children was higher than that in children with normal weight. The energy density in the snacks used, their delicious flavor, and watching television were considered as the factors predicting obesity in children. Some of the differences in results may be attributed to their higher number of study subjects and the selection of samples from different urban and rural areas. In another study by Solhi et al. (38), the higher student age was accompanied by the higher frequency of snacks and obesity. Also, there has been a significant relationship between obesity, age and nutritional behaviors in Shakeri's study (35). These differences in results can be attributed to the differences in the studied population type, the socio-economic status of participants, and the type of consumed foods at the snacks.

4-1. Strengths and limitations of the study

Some strengths of this study are the random sampling method (cluster sampling), studying of both sexes (boys and girls), the selection of samples from different urban areas, sample selection according to economic and social status, and selection from public and private schools, alongside the assessment of physical activity levels. Some study limitations that can be pointed out are self-reporting of food intakes, time-consuming process of questionnaire completion, and

the unwillingness of some students to take part in the study.

5- CONCLUSION

The status of weight in most students was undesirable, most of them being underweight. More than half of the students did not have a regular intake of breakfast. Parents should be more careful about the students' nutritional behaviors, including how to eat breakfast and snacks, and the type and amount of food items they consume. It is also suggested that interventional studies be conducted to determine the effect of training programs on improving regular and appropriate consumption of breakfast and snacks for weight control in primary school students.

6- ETHICAL CONSIDERATIONS

This study was approved by Urmia Medical Sciences University Ethics Committee with this code of ethics: 1396.42.IR.UMSU. REC. All participants were well informed about the purpose of the study. Each participant's parents provided a written consent for participation in the study. The participation was voluntary and they were announced that they can deny their cooperation at any given time. They were also assured about the privacy and confidentiality of their information. All methods and procedures were performed in accordance with the declaration of Helsinki.

7- CONFLICT OF INTEREST

None.

8- AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

9- AUTHORS' CONTRIBUTIONS

FH cooperated in study running and executing plus data gathering and entering. MH took part in study designing and

directing. FN took part in data collection alongside the scientific evaluation and editing. DV participated in study designing, data handling and analysis, and full manuscript preparation.

10- ACKNOWLEDGMENT

The researchers hereby express their gratitude and appreciation to Urmia University of Medical Sciences, Vice-chancellor of research and technology, teachers and students of schools in first and second districts of training and education organization in Urmia.

11- REFERENCES

1. Raj M, Kumar RK. Obesity in children & adolescents. The Indian journal of medical research. 2010; 132(5):598.
2. Update on the Commission on Ending Childhood Obesity: report by the Director-General. Geneva [Internet]. 2015.
3. Esfarjani F HA, Rostae R, et al. Evaluation of prevalence of obesity and lifestyle in overweight primary school children of Tehran. Second Health Child Seminar; Jahad Daneshgahi 2009.
4. Haeri F, Shariatpanahi SP, Kafeshani M. Prevalence of Obesity in the First Grade Primary School Children in Mehriz, Iran, based on Different References of Body Mass Index. Journal of Health System Research. 2022; 17(4):0-.
5. Abrams P, Katz LEL. Metabolic effects of obesity causing disease in childhood. Current Opinion in Endocrinology, Diabetes and Obesity. 2011; 18(1):23-7.
6. Moore GF, Tapper K, Murphy S, Lynch R, Raisanen L, Pimm C, Moore L. Associations between deprivation, attitudes towards eating breakfast and breakfast eating behaviours in 9–11-year-olds. Public health nutrition. 2007; 10(6):582-9.
7. Adair LS, Gordon-Larsen P, Du S, Zhang B, Popkin BM. The emergence of cardiometabolic disease risk in Chinese

- children and adults: consequences of changes in diet, physical activity and obesity. *Obesity reviews*. 2014; 15:49-59.
8. WHO. Global school-based student health survey (GSHS). WHO CHP. 2009.
9. Saeidlou SN, Babaei F, Ayremlou P. Children malnutrition in northwestern, central and southern regions of Iran: does geographic location matter? *Global journal of health science*. 2014; 6(4):36.
10. Llewellyn A, Simmonds M, Owen C, Woolacott N. Childhood obesity as a predictor of morbidity in adulthood: a systematic review and meta-analysis. *Obesity reviews*. 2016; 17(1):56-67.
11. Reinehr T. Lifestyle intervention in childhood obesity: changes and challenges. *Nature Reviews Endocrinology*. 2013; 9(10):607.
12. Gill T. Managing and preventing obesity: Behavioral factors and dietary interventions: Elsevier; 2014.
13. Murakami K, Livingstone MBE. Associations between meal and snack frequency and overweight and abdominal obesity in US children and adolescents from National Health and Nutrition Examination Survey (NHANES) 2003–2012. *British Journal of Nutrition*. 2016; 115(10):1819-29.
14. Zerati M PP, Razaviyr S, Dastgiri S. Prevalence of Junk food consumption among male and female students in schools of Tabriz. *Congress of nutrition; Tabriz2008*.
15. Taii N DS, Saki R. Survey of nutritional habits in school children in Khorramabad city. *Congress of nutrition; Tabriz, Iran 2008*.
16. Committee DGA. Report of the dietary guidelines advisory committee on the dietary guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services. Agricultural Research Service. 2010.
17. Bruening M, Afuso K, Mason M. Associations of eating two breakfasts with childhood overweight status, sociodemographics, and parental factors among preschool students. *Health Education & Behavior*. 2016; 43(6):665-73.
18. DELVARIAN ZM, KHOSRAVI A, TAGHAVI N, BOLBOL HN, SADEGHIAN F, KHATIBI MR. Nutritional Evaluation of Adolescent Middle School Girls in Shahroud. 2012.
19. Hoyland A, McWilliams K, Duff R, Walton J. Breakfast consumption in UK schoolchildren and provision of school breakfast clubs. *Nutrition Bulletin*. 2012; 37(3):232-40.
20. O'Neil CE, Nicklas TA, Fulgoni III VL. Nutrient Intake, Diet Quality, and Weight Measures in Breakfast Patterns Consumed by Children Compared with Breakfast Skippers: NHANES 2001–2008. *AIMS public health*. 2015; 2(3):441.
21. Lawman HG, Polonsky HM, Vander Veur SS, Abel ML, Sherman S, Bauer KW, Sanders T, Fisher JO, Bailey-Davis L, Ng J, Wye GV, Foster GD. Breakfast patterns among low-income, ethnically-diverse 4 th-6 th grade children in an urban area. *BMC public health*. 2014; 14(1):604.
22. Brown AW, Bohan Brown MM, Allison DB. Belief beyond the evidence: using the proposed effect of breakfast on obesity to show 2 practices that distort scientific evidence. *The American journal of clinical nutrition*. 2013; 98(5):1298-308.
23. Antonogeorgos G, Panagiotakos D, Papadimitriou A, Priftis K, Andricopoulos M, Nicolaidou P. Breakfast consumption and meal frequency interaction with childhood obesity. *Pediatric obesity*. 2012; 7(1):65-72.
24. Wang L, Zhou B, Zhao Z, Yang L, Zhang M, Jiang Y, Li Y, Zhou M, Wang L, Huang Z, Zhang X, Zhao L, Yu D, Li C, Ezzati M, Chen Z, Wu J, Ding G, Li X.

Body-mass index and obesity in urban and rural China: Findings from consecutive nationally representative surveys during 2004–18. *The Lancet*. 2021; 398(10294):53-63.

25. WHO. www.who.int/entity/mediacentre/factsheet/fs311/en/ who Report. 208.

26. Rodig NM, Roem J, Schneider MF, Seo-Mayer PW, Reidy KJ, Kaskel FJ, Kogon AJ, Furth SL, Warady BA. Longitudinal outcomes of body mass index in overweight and obese children with chronic kidney disease. *Pediatric Nephrology*. 2021; 36(7):1851-60.

27. Moore JB, Hanes Jr JC, Barbeau P, Gutin B, Treviño RP, Yin Z. Validation of the Physical Activity Questionnaire for Older Children in children of different races. *Pediatric Exercise Science*. 2007; 19(1):6-19.

28. Janz KF, Lituchy EM, Wenthe P, Levy SM. Measuring activity in children and adolescents using self-report: PAQ-C and PAQ-A. *Medicine and science in sports and exercise*. 2008; 40(4):767-72.

29. Jeans MR, Asigbee FM, Landry MJ, Vand Yousefi S, Ghaddar R, Leidy HJ, Davis JN. Breakfast consumption in low-income hispanic elementary school-aged children: associations with anthropometric, metabolic, and dietary parameters. *Nutrients*. 2020; 12(7):2038.

30. Rahimi T, Dehdari T, Ariaeian N, Gohari M. Survey of breakfast consumption status and its predictors among Qom students based on the Pender's health promotion model constructs. *Iranian Journal of Nutrition Sciences & Food Technology*. 2012; 7(2):75-84.

31. Doostan F, Hosseini Nasab A, Kamyab S. Assessment of Dietary Behaviour and its Relationship with Body Mass Index among Junior High School Girls in Kerman during 2012-2013. *Journal of*

Health and Development. 2016; 5(4):285-96.

32. Hanson T, Austin G, Lee-Bayha J. Student health risks, resilience and academic performance in California. *California Healthy Kids Survey Factsheet*. 2003; 1.

33. Ahadi Z, Qorbani M, Kelishadi R, Ardalan G, Motlagh ME, Asayesh H, Zeynali M, Chinian M, Larijani B, Shafiee G, Heshmat R. Association between breakfast intake with anthropometric measurements, blood pressure and food consumption behaviors among Iranian children and adolescents: the CASPIAN-IV study. *Public Health*. 2015; 129(6):740-7.

34. Smetanina N, Albaviciute E, Babinska V, Kalinauskiene L, Albertsson-Wikland K, Petrauskiene A, Verkauskiene R. Prevalence of overweight/obesity in relation to dietary habits and lifestyle among 7–17 years old children and adolescents in Lithuania. *BMC Public Health*. 2015; 15(1):1001.

35. Shakeri M, Mojtahedi Y, Moradkhani M. Obesity among female adolescents of Tehran schools. *Journal of Payavard Salamat*. 2013; 6(5):403-11.

36. Blondin S, Anzman-Frasca S, Django H, Economos C. Breakfast consumption and adiposity among children and adolescents: an updated review of the literature. *Pediatric obesity*. 2016; 11(5):333-48.

37. Maffeis C, Grezzana, Perrone L, Del Giudice EM, Saggese G, Tatò L. Could the savory taste of snacks be a further risk factor for overweight in children? *Journal of pediatric gastroenterology and nutrition*. 2008; 46(4):429-37.

38. Solhi M, Jazayeri S, Amiri F. Snack consumption status and obesity in secondary school male students. *Rahavard Salamat Journal*. 2016; 2(3):27-37.