

Original article

Factors affecting the choice of healthy snacks in primary school students of Southern Iran

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Abstract: *Background* — Healthy nutrition is crucial in preventing obesity and noncommunicable diseases, as well as for the physical growth and optimal health. This study investigates the factors influencing the choice of healthy snacks in primary school students of Southern Iran.

Methods — Using proportional stratified random sampling, this cross-sectional (descriptive and analytical) study was performed on primary school students of Southern Iran. The data collection instrument included a questionnaire comprising demographic information, information on healthy snack consumption, and questions on individual, family, and social factors affecting healthy snack consumption. Data analysis was performed using the SPSS version 20 software.

Results — A total of 388 students participated in the study; 57% were girls, approximately 55% were urban residents. The most significant predictors of healthy snack consumption were friends' snack choice ($\beta=-0.342$), daily allowance size ($\beta=-0.255$), having a younger school-age sibling ($\beta=-0.185$), and being taught healthy food choices at school ($\beta=0.176$).

Conclusion — Individual student preferences and the behavior of family members, peers, school administrators, and snack vendors can be effective in influencing healthy snack choices. Therefore, educational and non-educational interventions at the social level, especially at school, are needed.

Keywords: healthy snack, students, obesity, Southern Iran.

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Introduction

Over the past 30 years, the prevalence of chronic diseases in children and adolescents has increased, especially asthma, obesity, and behavioral/learning problems such as attention deficit hyperactivity disorder [1].

We witness a global epidemic of rising obesity, diabetes, and other noncommunicable diseases, particularly in developing and transition economies, as well as in less affluent and developed countries. At the same time, an increasing number of communities and households suffer from both nutritional deficiency and overconsumption [2]. Healthy foods are foods that contain the nutrients the body needs. Healthy foods have balanced nutrients for the body to use [3]. Healthy eating is essential for students' learning and academic progress [4].

Unhealthy eating habits increase the risk of obesity [5]. Healthy eating is vital for the prevention of obesity and noncommunicable diseases, as well as for physical development and optimal health [6, 7]. In contrast, Malnutrition is a key risk factor for noncommunicable diseases. Globally, almost one in three people suffers from at least one form of malnutrition. Both categories of malnutrition (caused by unbalanced intake of energy or nutrients) can have various adverse consequences such as

stunting, wasting and micronutrient deficiencies, overweight, obesity, diet-related noncommunicable diseases. Unhealthy and poor-quality diets cause these problems. Childhood malnutrition, in addition to affecting survival, growth, development, health, and educational or economic outcomes, is a risk factor for overweight and noncommunicable diseases in older age [8].

Therefore, healthy snack consumption habits among primary school children are critical as they provide more energy and nutrients, and healthy food choice behavior should be established from the early stages of life [9].

Snacks are part of eating habits at all stages of life. The quality and nature of snacks influence health throughout the life course. Unhealthy snacks that are high in energy, sugar, and salt and low in nutrients have been shown to be detrimental to human health, such as oral health, blood pressure, obesity, and diabetes. Consequently, it is important to encourage people to consume healthy, nutrient-dense snacks through education, i.e., to help them plan their snacking to improve health and reduce disease risk [10].

Fast food is popular among children and adolescents. However, its consumption is often associated with adverse nutritional and health consequences [11]. Snacking patterns among children and adolescents are typically characterized by

high-calorie, low-nutrition foods, which are associated with an increased risk of obesity [10].

Consumption of highly processed foods among children and adolescents is associated with a high prevalence of emotional and behavioral problems [12]. Sugar consumption among children and adolescents has approached problematic levels in most countries. The Chinese government has established administrative regulations in this area and monitors their implementation, but has not achieved good results [13].

Hunger and low-quality food consumption in primary school age cause adverse health effects and are the leading cause of chronic diseases in adulthood [14]. Unfortunately, since elementary school, children have the habit of purchasing and eating snacks without paying attention to their health and safety [15]. Primary school age is the stage of formal operational situation in which a child can think logically and draw conclusions from available information [16].

Table 1. Demographic and individual parameters affecting the choice of healthy snacks in primary school students: a cross-sectional study in Southern Iran (n=388)

Parameter	Count	%
Age, years	9	28.6
	10	23.7
	11	25.3
	12	22.4
Gender	Male	43
	Female	57
Birth order status	First	40.2
	Second	27.6
	Third and more	32.2
Residential status	Urban	55.15
	Rural	44.84
Having a brother or sister of primary school age	Yes	43
	No	57
Father's age, years	Under 30	10.6
	30-39	74.2
	40-49	16.3
	50 and above	16
		1402
Mother's age, years	Under 30	18.6
	30-40	46.9
	40-50	20.4
	Above 50	14.02
		1402
Obesity of the child	Yes	33.2
	No	66.8
Grade	Fourth	34.8
	Fifth	34.5
	Sixth	30.7
Father's education	Less than high school diploma	4.4
	High school diploma	26
	Associate Degree	12.1
	Bachelor's degree	32.7
	Master's degree and higher	24.7
Mother's education	Less than high school diploma	1
	High school diploma	31.2
	Associate Degree	8.8
	Bachelor's degree	36.1
Father's employment	Government	40.7
	Freelance	53.6
	Unemployed	5.7
Mother's employment	Government	27.6
	Freelance	8.5
	Housewife	63.9
Size of daily allowance	Less than half a dollar	69.3
	More than half a dollar	30.7
Obesity in family members	Yes	51.3
	No	48.7

Many individual, family, and social factors influence the snack consumption habits of primary school students. Hence, it is important to identify these factors in each region for implementing appropriate interventions to make children healthier and, consequently, have healthier adults [17, 18]. In this context, people in Southern Iran have different eating habits, beliefs, geographic status and socioeconomic status compared with most cities in Iran and even other countries. Therefore, we decided to conduct a study examining the factors influencing healthy snack choices among primary school students in Southern Iran.

Methods

This study investigated the factors influencing the choice of healthy snacks among primary school students in Southern Iran. The study population consisted of primary school students in Jiroft, Southern Iran, in 2022; 388 students were included in the study by means of proportional stratified random sampling.

The schools were randomly selected among elementary schools in the city and village (4 schools in each). Each school randomly selected a sample according to the number of students in each class. The inclusion criteria for the study were: fourth- to sixth-grade students without certain diseases requiring special diets (this was identified by asking the student), and willingness to participate. Students who were unwilling to participate in the study were excluded.

The data collection instrument was a four-part questionnaire designed by us, including demographic information, healthy snack consumption, individual factors of healthy snack consumption, and family and social factors affecting healthy snack consumption. Demographic information was collected from responses to 15 questions: age, gender, birth order status, place of residence, presence of a younger school-age brother or sister, father's age, mother's age, education level, father's education, mother's education, father's occupation, mother's occupation, size of daily allowance, obesity in family members (according to the child's opinion and perception) and the child.

Status of healthy snack consumption per week was assessed with eight questions: (1) I eat fruits and vegetables at least three times per week; (2) According to the food label and parents' advice, I eat low-fat snacks; (3) I do not eat salty snacks; (4) I eat nuts and dried fruit as snacks at least three times per week; (5) I eat sweet snacks containing much sugar such as candy, chocolate and ice cream no more than three times per week; (6) I eat homemade cakes and natural fruit juices instead of purchased pastry and juices; (7) I use boiled eggs for snacks during the week; (8) I always try to use healthy homemade snacks. Each question was answered using a 5-point Likert scale from *Never* (1 pt) to *Always* (5 pts). The total score of healthy snacks ranged from 8 to 40.

The questions regarding individual factors of healthy snack consumption (n=8) included eight questions, including the reason for eating snacks, the number of purchases from the school cafeteria per week, reading the expiration date label of foods, reading the food flavor labels, reading the ingredients of foods, the duration of TV watched per day, the duration of mobile and computer games played per day, and the number of breakfasts per week.

Table 2. Difference between means and standard deviations of healthy snack consumption for individual factors affecting snack consumption among primary school students (n=388)

Variable		Mean ± SD	Standard error	F	p-value
Reason for eating snacks	To keep me full and healthy	19.85 ± 2.79	0.26	3.69	0.028*
	For fun and entertainment	19.35 ± 2.39	0.15		
	Because they taste good	18.65 ± 1.81	0.29		
The number of purchases from the school cafeteria per week	None	21.34 ± 2.98	0.41	10.82	≤0.0001*
	1-2	19.46 ± 2.88	0.34		
	3-4	19.23 ± 2.17	0.21		
	5-6	19.15 ± 2.18	0.28		
	Every day	18.78 ± 1.83	0.18		
I often read the expiration date labels	Yes	19.90 ± 3.01	0.30	7.02	0.028**
	No	19.26 ± 2.26	0.13		
I often read food flavor labels	Yes	19.29 ± 2.30	0.12	6.98	0.008**
	No	20.26 ± 3.30	0.45		
I often read food ingredient labels	Yes	19.94 ± 2.99	0.32	5.89	0.029**
	No	19.28 ± 2.99	0.13		
TV watched per day	Less than an hour	19.38 ± 2.22	0.29	0.38	0.764*
	Between 1 and 2 h	19.55 ± 2.50	0.17		
	Between 2 and 3 h	19.26 ± 2.59	0.28		
	More than 3 h	19.23 ± 2.52	0.36		
Games played on mobile devices and computers per day	Less than an hour	19.51 ± 2.27	0.23	0.53	0.657*
	Between 1 and 2 h	19.32 ± 2.30	0.14		
	Between 2 and 3 h	19.85 ± 2.90	0.55		
	More than 3 h	19.69 ± 4.13	0.86		
Number of breakfasts consumed per week	None	18.97 ± 1.90	0.31	1.06	0.376*
	1-2	19.80 ± 3.48	0.76		
	3-4	19.16 ± 2.03	0.21		
	5-6	19.45 ± 2.78	0.23		
	Every day	19.73 ± 2.31	0.23		

*one-way ANOVA was used to compare several population means; **T-test was used to compare the means of two groups.

Table 3. Difference between means and standard deviations of healthy snack consumption for family factors affecting snack consumption among primary school students (n=388)

Variable		Mean ± SD	Standard error	F	p-value
Type of food recommended by parents	Yes	19.61 ± 2.56	0.14	5.87	0.002**
	No	18.63 ± 1.88	0.22		
Preparation of food for school by parents	Yes	19.52 ± 2.62	0.16	6.68	0.227**
	No	19.20 ± 2.10	0.19		
Informing parents about the type of food consumed at school	Yes	19.50 ± 2.51	0.14	0.22	0.293**
	No	19.20 ± 2.38	0.23		
Type of snack consumed at home	Often healthy	19.78 ± 2.30	0.13	0.34	≤0.0001**
	Often unhealthy	18.51 ± 2.69	0.25		

**T-test was used to compare the means of two groups.

The family factors regarding healthy snack consumption were included in four questions about parents preparing food for school, informing parents about the type of food consumed at school, the type of snack consumed by family members at home, and the type of food recommended by parents. Social factors affecting healthy snack consumption included three questions about healthy snack choices taught at school, teaching the importance of healthy snacks at school, availability of healthy foods at school, and friends' choice of snacks.

Our study was conducted in accordance with the Declaration of Helsinki and the guidelines for ethics in biomedical research of the Iranian Ministry of Health (ethical code IR.JMU.REC.1398.014), after prior coordination with school principals and teachers, and in coordination with the students' parents, thereby creating a friendly atmosphere for the students. The students were administered the questionnaires only if they wanted to.

The relevant professors confirmed the validity of the questionnaires, and the reliability of the questionnaire was

confirmed by the Cronbach's alpha method (yielding Cronbach's alpha exceeding 0.71). The trained health workers administered the questions to the students who freely and voluntarily wanted to participate in the study, and students' responses were check-marked in the questionnaire. The data analysis was performed using the SPSS version 20 software. Descriptive and analytical statistics such as linear regression, ANOVA and T-test were used. Statistical significance was assumed at $p < 0.05$.

Results

A total of 388 school students participated in the study: 57% (n=111) of them were girls, and approximately 55% (n=214) of them were urban residents (Table 1).

We observed a statistically significant association of healthy snack consumption with the following parameters: age groups ($p=0.003$), having a sibling of primary school age ($p=0.001$), mother's education level ($p \leq 0.0001$), size of daily allowance ($p \leq 0.0001$), child obesity ($p=0.030$) and obesity in the family

($p \leq 0.0001$). In this regard, increases in child age, having a sibling of primary school age and daily allowance, as well as child obesity and obesity in the family were not associated with healthy snack choice behavior and were consistent with mother's education level.

Regarding the individual factors of healthy snack consumption and the assessment of healthy snack consumption (score), we revealed a statistically significant difference of the healthy snack consumption score with the reason for eating snacks ($p=0.028$), number of purchases from the school cafeteria per week ($p \leq 0.0001$), reading the expiration date labels ($p=0.028$), reading the food flavor labels ($p=0.008$), and examining the food ingredient labels ($p=0.029$). We found no correlation between the healthy snack consumption score and other individual factors ($p > 0.05$). Regarding individual factors of healthy snack choice, their highest mean values were observed for choosing a healthy snack to keep oneself full and healthy (part of the reason for eating snacks), absence of snack purchases from a school cafeteria, reading the expiration date labels, not reading the food flavor labels, and reading the food ingredient labels (Table 2).

Regarding the family factors of healthy snack consumption and the assessment of healthy snack consumption (score), statistically significant differences were detected for the type of food recommended by parents ($p=0.002$), the type of snack consumed at home by family members ($p \leq 0.0001$), but no correlation was found between other family factors and the healthy snack consumption score ($p > 0.05$). Therefore, parents' suggestions regarding the type of snacks and eating healthy snacks at home were consistent with the healthy snack consumption of students at school (Table 3).

As for the social factors of healthy snack consumption, we discovered statistically significant differences of friends' choice of snacks ($p \leq 0.0001$) and the importance of teaching healthy snacks at school ($p \leq 0.0001$) with the healthy snack consumption score, but no correlation was found between other social factors and the assessment of healthy snack consumption ($p > 0.05$). Therefore, not choosing a peer for snacking at school and being taught the importance of healthy snacks at school were associated with eating healthy snacks (Table 4).

According to our findings compiled in Table 5, having a sibling of primary school age, mother's education level, obesity in the family, size of daily allowance, reason for eating snacks, purchasing snacks from school cafeteria, healthy eating education at school, and friends' choice of snacks could predict the variance of healthy snack consumption behavior in primary school students of Southern Iran with 47.1% accuracy. Among these factors, friends' choice of snacks ($\beta = -0.338$), daily allowance ($\beta = -0.248$), having a primary school age sibling ($\beta = -0.183$), mother's education level ($\beta = 0.160$) and healthy eating education at school ($\beta = 0.157$) were the most important predictors of healthy snack choice.

Discussion

The results of our study demonstrated statistically significant differences of the consumption of unhealthy snacks with the age group of the student, having a sibling of primary school age, child obesity, and obesity of a family member. In addition, the consumption of healthy snacks was significantly associated with the level of mother's education. Not purchasing snacks from the school cafeteria, reading the expiration date labels, not reading the food flavor labels, and reading the food ingredient label were among the reasons for choosing a healthy snack. We established statistically significant associations of healthy snack consumption with the parental recommendation of the type of snack to be consumed at school and the type of snack consumed by family members at home with healthy snack consumption.

In the present study, the consumption of healthy snacks declined with the increase in the student's age, and also the level of mother's education was significantly associated with the consumption of healthy snacks. In the study by Cullen et al., fourth-grade students used more healthy snacks than fifth-grade students [19]. The reason for this difference may be due to the increase in their pocket money and the influence of friends on snack choices with age. In the studies by Feyzabadi [20] and Thrimavithana [21], higher family income and size of daily allowance were associated with higher consumption of unhealthy snacks.

Table 4. Difference between means and standard deviations of healthy snack consumption for social factors affecting snack consumption among primary school students

Variable		Mean \pm SD	Standard error	F	p-value
Always eating healthy foods at school	Yes	19.58 \pm 2.63	0.16	6.56	0.067
	No	18.08 \pm 21.07	0.18		
Healthy snack choices are taught at school	Yes	19.75 \pm 2.59	0.15	9.91	$\leq 0.0001^{**}$
	No	18.55 \pm 1.89	0.18		
Friends' choice of snacks	Yes	16.50 \pm 1.38	0.18	9.14	$\leq 0.0001^{**}$
	No	19.88 \pm 2.29	0.12		

**T-test was used to compare the means of two groups.

Table 5. Linear regression results for predicting factors influencing healthy snack choices in surveyed students (n=388)

Parameter	B	SE	Beta	P-value	F	R ²
Constant (a)	25.48	0.795		≤ 0.0001		
Having a sibling of primary school age	-0.917	0.192	-0.183	≤ 0.0001		
Mother's education	0.337	0.079	0.160	≤ 0.0001		
Obesity in the family	-0.733	0.198	-0.139	≤ 0.0001		
Size of daily allowance	-1.33	0.209	-0.248	≤ 0.0001	44.067	47.1
Reason for eating snacks	-0.432	0.157	-0.103	≤ 0.0001		
Purchases from the school cafeteria	-0.280	0.069	-0.154	≤ 0.0001		
Healthy food choices are taught at school	0.873	0.207	0.157	≤ 0.0001		
Friends' choice of snacks	-2.438	0.278	-0.338	≤ 0.0001		

In our study, children whose mothers had a higher level of education consumed healthier snacks. In the study by Thrimavithana, there was no significant association between unhealthy snacks and the educational status of parents [21]. Similar to the present study, a study by Abedi et al. established a statistically significant association between snack consumption and mother's education level [4]. In the study by Gibson et al., more educated parents with knowledge about nutrition had children who consumed more healthy and fewer unhealthy snacks [22]. It is known that raising awareness among students and their families has a significant impact on healthy food consumption among students. Hence, planning should be done to raise awareness among students and their families through educating them on detrimental consequences of unhealthy food consumption.

Not purchasing snacks from the school cafeteria, reading the expiration date labels, not reading the food flavor labels, and reading the nutrition labels were among the reasons for choosing a healthy snack in our study. In the study by Nor et al., flavor and price were the main reasons for reading food labels [23]. In the study by Kang et al., the main reason for elementary school students to buy food was flavor, and they were often buying carbohydrate-rich and sugar-rich foods [24]. In the study by Cho et al., flavor was the main reason for snack choice rather than health and nutritional value [9]. In the study by Yamasaki et al., lack of understanding of food nutrition labels was the most important cause of increased consumption of caffeinated drinks and energy drinks [25]. However, it should not be forgotten that overweight and obesity can be a factor in the consumption of unhealthy snacks, sugar, salt, and carbonated beverages [12, 25]. Raising awareness and practicing reading food labels in children can help them make informed decisions about food choices and levels of consumption, promote healthy eating habits, and empower adolescents to make healthy choices regarding their food.

There were statistically significant associations of parental advice on the type of consumed food and the type of snack consumed by family members at home with the consumption of healthy snacks in the present study. Parental advice on the type of snack consumed and the use of healthy snacks at home were significantly associated with the consumption of healthy snacks among primary school students. In the study by Feyzabadi et al., easy access and weak parental control played a role in the consumption of unhealthy snacks [20]. In the study by Liu et al. [6], dietary advice and parental supervision were key family factors in the healthy food choices of adolescents. The results of the study by Muhasidah et al. showed that snacks that children eat at home or that are prepared at home are often healthy. However, very few children eat healthy foods at home and learn about them at home, while most are aware of healthy foods [26]. Parents should emphasize the importance of eating more healthy snacks, provide children with a context for eating healthy foods, and encourage them to eat more healthy snacks.

Our findings implied significant associations of healthy snacks taught at school and peer snack choices with healthy snack consumption. Results from Zhang et al.'s study showed a direct significant correlation between sugar-sweetened beverage consumption among peers, indicating that individuals are more likely to consume excessive amounts of sugar when their peers also exhibit such behavior [13]. In Bastami et al.'s study, peers,

school principals, and snack vendors were among the main factors influencing the type of snacks consumed at school [27].

School environment provide an ideal setting for promoting healthy eating behavior because most children attend school regularly and consume at least one meal and some snacks daily. However, primary school teachers often demonstrate lack of knowledge on nutrition, low self-efficacy, and poor skills to effectively deliver nutrition education [28]. In the study by Cluss et al., healthy food purchases by primary school students directly depended on the availability of healthy foods in the school cafeteria [29]. In the studies by Cullen and Neumark-Sztainer, school policies (food access and promotion) were directly related to healthy/unhealthy snack consumption [30, 31]. Therefore, primary school teachers should always monitor the types of snacks sold to their students. In addition to students, educational interventions should be provided to teachers and school food vendors.

Limitations of our study include the young age of the children, the time required for students to complete the questionnaires, and the short non-curricular hours of students at school, which may have affected the accuracy of their responses to the questionnaire. We certainly tried to improve the accuracy of responses by explaining students the content of the questionnaire and seeking their cooperation.

Conclusion

Among the factors, the most important predictors of healthy snack consumption were friends' choice of snacks, daily allowance, having a sibling in primary school, mother's education and healthy food choices taught at school. It can be concluded that the factors effective in snack consumption by students are combined into two major groups, viz.: (1) effective behavior and (2) effective emotions and perceptions. Influential behavior includes the behavior of students, family members, peers, school administrators and snack vendors.

Therefore, it is necessary not only to conduct educational interventions for students, parents, teachers and food vendors, but also in this context, to undertake health promotion measures such as policies and enactment of laws and regulations, and monitoring the implementation of laws. The supply of healthy food and its balanced consumption by students should be supported and encouraged. It is recommended to carry out educational and non-educational intervention studies (political, legal, economic and organizational) to measure the impact of interventions on healthy and unhealthy snack consumption among students.

Ethical approval and consent to participate in the study

All participants were informed that studies involving human participants complied with the ethical standards of the Institutional Research Committee and the 1964 Declaration of Helsinki and its latest amendments. All study participants signed the informed consent statement prior to participating in the study. This study was approved and supported by Jiroft University of Medical Sciences (Code: IR.JMU.REC.1398.014).

Availability of data and raw materials

The datasets used or analyzed during this study are available from the corresponding author on a reasonable request.

Conflict of interest

None declared.

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Author contributions

RF and SD were involved in all aspects of the study concept and design, data collection and analysis, interpretation of the results, draft manuscript preparation, and critical revision of the manuscript; DPM and TR helped with the general design of the study, data analysis, interpretation of the results, co-authoring draft manuscript, and final editing. All authors have read and approved the final version of the manuscript.

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