

Nutritional Knowledge, Practice, and Dietary Habits among School Children and Adolescents

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ABSTRACT

Background: Although nutritional status of children and adolescents is of great concern various interventions and modifications aiming at promotion of healthy eating behaviors have limited impact due to insufficient understanding of dietary habits between different age groups and genders. The aim of this study in not only evaluation of nutritional knowledge, practice, and dietary habits of primary school and junior high school students in Isfahan province, but also this research explore crucial differences regarding gender and living area of the above-mentioned population in Iran.

Methods: This cross-sectional study was conducted on 4700 primary school and junior high school pupils in Isfahan province. Data were collected through standard 24-h recall food frequency questionnaire and researcher-designed questionnaire. Independent *t*-test was applied for comparison of mean values of total units of consumed food materials. Qualitative variables were compared by using the Chi-square test. Data were analyzed by ACCESS 2010 and SPSS 18 software.

Results: Nutritional knowledge of female pupils and junior high school students was higher than their male and elementary school students respectively; still, theses superiorities did not lead to higher practice score. Bread and cereals group received daily intakes in accordance with food and drug administration (FDA) recommendations. Indeed, vegetables, milk, and dairy products, as well as meat daily intakes, were lower than the FDA recommendation, whereas fats, oils, and sugars intakes were higher. In comparison to females, male participants had significantly lower consumption of vegetables and fruits whilst they had a higher intake of carbohydrates, fats, and meats.

Conclusions: Our results showed that adolescents failed to meet sufficient nutritional requirements, and they had an imbalanced diet, which was considerably low in several essential nutrients and high in some food materials.

Keywords: Child, food habit, malnutrition, nutrition health, nutritional deficiency, nutritional status

INTRODUCTION

Nutritional intake as a pivotal element contributing to human health and well-being is of great importance and its role in childhood and adolescence is more prominent and of greater concern. Nutritional intake has a special direct effect on children's health due to their physical and mental growth as well as cognitive development. Furthermore, it has long-term effects on general health status through formation of life-long eating behaviors in children.^[1,2] Food intake patterns and overweight are associated with different immediate complications and major long-term consequences including cardiovascular diseases, diabetes, high blood pressure, stroke, cancer, dental caries, asthma, and some other psychological disorders like depression.^[3-5] Thus, quality of children's and adolescents' diet has become a major concern for researchers. In recent decades, there have been considerable efforts following changes in diet and types of consumed foods leading substitution of fast foods with salutary traditional meals. However, the majorities of children do not meet recommended standards of dietary guidelines and are devoid of healthy dietary habits.^[2,6] In addition, dietary quality would be exacerbated when children grow up by not only lower consumption of fruits, vegetables, and milk, but also higher consumption of soft drinks.^[7,8]

In recent years, health organizations have implemented a variety of interventions to promote healthy eating behaviors of young population, yet they have had limited impact, which might be attributable to insufficient understanding of dietary habits and necessary interventions implemented in accordance with children ages.^[2,9] As Shepherd *et al.* indicated in their study, dietary influences vary with age, and not all interventions are suitable for all age groups.^[3] Yet, to date, relatively little research has examined nutritional knowledge, practice and attitudes of Iranian young population and related differences between different age groups and genders in many aspects of this field have not clearly been defined. On the other hand, more than 27% of the Iranian population are between 10 and 19 years of old,^[10] which prioritize promotion of dietary healthy programs aiming healthier society development. Therefore, we aimed to evaluate dietary program

and nutritional knowledge of a representative sample of primary school and junior high school students in Isfahan province, beside evaluation of their food intake status in comparison to recommendations, underscoring probable existent differences and imbalances regarding age, gender and living area.

METHODS

Settings

This survey was a cross-sectional study conducted between September 2009 and March 2010 on 4700 primary and junior high school pupils of Isfahan province, which is one of the largest provinces of Iran.

Study design and sampling

Sample size comprised 4700 students, which included 2867 and 1833 primary school and high junior school students, respectively. Nutritional practice score was applied for sample size calculation while level of confidence and drop-out rate were 95% and 2%, respectively. Bunches of multistage cluster sampling were proportionally selected in accordance with the student population of different towns in Isfahan province as well as the total number of the student population at each educational level. In addition, the proportion of urban population to rural one was considered in every town whilst male to female ratio was considered to be equal. Inclusion criteria comprised students residing in Isfahan province and were studying at either primary school or junior high school. Exclusion criteria included either refusal announcement or discontent expression for being a subject. Under missing analysis was implemented for incomplete questionnaires.

Data collection tools

Questionnaire-based method was implemented for data collection through trained questioners and participating students and parents. Two various questionnaires were used included standard and researcher-designed questionnaire. All questionnaires were coded. Former questionnaire was used to determine average daily consumption in every seven food groups, whereas the latter one was applied for evaluation of nutritional knowledge

and practice in the respective groups. All of the 24 questions, in the standard questionnaire, were answered by mothers on a holiday and 2 nonholiday days. The standard questionnaire consisted of a variety of multiple-choice, open-ended and yes/no questions. Serving size and details of consumed foods were provided by subjects as far as possible. Questioners' guidance was available for mothers within the period they were completing the questionnaire at home. Afterward, amounts of food ingredients were calculated and prepared in standard tables regarding available routinely used recipes.

On the other hand, researcher-designed questionnaire consisted of 39 questions, which concerned about demographic nutritional knowledge and nutritional practice in 10, 19, and 10 questions respectively. All 39 questions were answered by students within 20 min (determined according to the pilot study).

Final score was calculated in base of the percentage for each individual whilst practice evaluation section had the main portion of the total score. Total scores being above 75 out of 100 were mentioned to be favorable while scores being between 50% and 74% or lower than 50% were reported as medium and poor nutritional practice, respectively.

Validity of the questionnaire was checked and obtained by consulting a number of experts, and the Cronbach's alpha coefficient was calculated to obtain reliability. Reliability analysis yielded Cronbach's alpha value of 0.70 for knowledge and practice scales. In order to make, necessary modifications pilot study questionnaires were distributed among 30 students of primary school and junior high school. Students' knowledge and awareness were assessed with regard to 5 main aspects including healthy eating, main food groups, main meals, minerals, and vitamins, as well as nutritional habits. Nutritional practice was evaluated by inquiry about food choices and daily consumption of food materials.

Ethical considerations

The study protocol was approved by Ethic Committee of Isfahan University of Medical Sciences. Participation in this study was voluntary. All information was anonymously collected, and the outcomes were used for research purposes.

Data analysis

Data extracted from questionnaires were analyzed in accordance with gender, living area (urban or rural), and educational level (primary or junior high school). Independent *t*-test was applied for comparison of mean scores of the above-mentioned groups, who completed nutritional knowledge and practice evaluation. Qualitative variables were compared using Chi-square test and finally all data were analyzed by ACCESS 2010 and (SPSS Inc., Chicago, IL, USA).

RESULTS

Total sample size comprised of 4700 participants, standard questionnaire and researcher-designed one reached 3673 and 4691, respectively, due to missing data and uncompleted returned questionnaires. Eighty-four percent (3923 students) of the understudied population were from urban areas while the rest 16% (768 cases) settled in rural regions. The ratio of males to females in sample groups from both urban and rural areas was equal. Almost 70% of cases were elementary school pupils, and the rest were students of junior high schools. Baseline characteristic data are demonstrated in Table 1.

Nutritional knowledge and practice evaluation

In general, 4691 filled questionnaires were collected from 4700 pupils. Data extracted from all filled questionnaires went under statistical analysis and missing analysis. As previously mentioned, students' knowledge score was analyzed in 3 steps comprising gender, age, and living area. Total mean scores were calculated for 5 distinct aspects of nutritional knowledge and were compared. Average total knowledge score for healthy eating was 48.95 ± 11.4 , which was shown to be significantly different between males and females. As shown in Table 2 female students' awareness regarding healthy eating tended to be higher than their male counterparts ($P < 0.001$). In comparison, students from urban areas seemed to have a higher awareness about healthy eating ($P < 0.001$). Likewise, junior high school students had significantly higher knowledge score on this issue than younger ones ($P < 0.001$). Detailed analyzed data regarding students' knowledge about healthy eating is shown in Table 2.

Table 1: Distribution of students in terms of gender and living area

Living area	Total		Rural		Urban	
	Percentage	Number	Percentage	Number	Percentage	Number
Gender						
Female	50	2344	50.8	390	49.8	1954
Male	50	2347	49.2	378	50.2	1969
Total	100	4691	100	768	100	3923

The same results were obtained with regard to main food groups and nutritional habits awareness status. Indeed, males and females did not show any difference except for food meals. To elaborate, urban pupils had a higher level of knowledge in all aspects except for minerals and vitamins and food meals. Whole data of knowledge evaluation in all 5 mentioned aspects are summarized in Table 2.

For both sections of nutritional practice part distinct mean scores were calculated and compared. Total average score for participants' food choices and consumption of different food groups was 85.8 ± 10.9 , while male participants gained higher mean score than girl students. Likewise, urban students were shown to be superior to rural ones in this regard. Primary school students had significantly higher practice score for this aspect in comparison with their junior high school counterparts. Moreover, students' mean score for daily consumption of food materials and groups was 55.4 ± 14.6 out of 100. Mean score of girls tended to be higher than boys, whereas this score was not affected by living area. Finally, primary school pupils had a higher practice score for this part than junior high school ones. All mentioned differences were statistically meaningful, and related data are reported in Table 2.

Food frequency evaluation

Almost 77% of 24-h recall food frequency distributed questionnaires were analyzable. Indeed, 1813 of them were filled by males and the rest (1860 questionnaire) were filled by female counterparts. Table 3 presents average amounts of daily consumption of food materials based on a defined unit of food groups. Average amount of daily consumption for bread and cereal group was 7.4 ± 2.1 units. Average amount of daily intake of fruits, vegetables, dairy products, meat, fats, sugar were 2.1 ± 1.2 , 1.0 ± 0.7 , 0.8 ± 0.6 , 3.5 ± 1.2 ,

6.2 ± 2.4 , 1.3 ± 1.1 , respectively. Females had significantly higher daily consumption of fruits and vegetables, while males had higher consumption of bread and cereals, fats, and meat products. Neither dairy consumption of products nor daily consumption of sugar differed between girls and boys. Mean units of consumed foods and *P* values are summarized in Table 3. While daily consumption of vegetables and meat were significantly higher in urban areas, no significant differences were found in daily consumption of other foods between urban and rural parts. In addition, milk and dairy group was the only one, which elementary school students had a higher intake than their junior high school counterparts [Table 3].

Prevalence distribution for eating meals showed that 0.8% of students did not eat a breakfast meal at all while regular consumption of this meal was significantly higher in primary school children. On the other hand, gender and living area did not statistically affect aforesaid meal. Details regarding consumption of 3 main meals and before noon, afternoon, and after dinner snack are shown in Table 4. In fact, the prevalence of people who did not eat lunch meal, afternoon snack, dinner and after dinner snack was 0.1%, 2.9%, 0.1%, and 16.1%, respectively. In comparison to males, females had higher consumption of each meal except for breakfast and dinner. Lunch consumption was the only criterion, which was not affected by educational level. Indeed, Compared to junior high school participants, elementary school pupils had significantly higher frequency in consumption of other meals. In addition, afternoon snack was more frequently consumed by urban students; still, frequency consumption of other meals did not affect by living area.

Carbohydrates were found to meet 64.1% of daily energy requirements in both female and male adolescent groups. Proteins and fats were the source of 12% and 23.8% of daily energy

Table 2: Comparison of nutritional knowledge and practice score of students in terms of gender, living area, and educational level

	Female	Male	P	Urban	Rural	P	Elementary school	Junior high school	P	Total
Mean score of knowledge for healthy eating	50.5±11.3	47.4±11.3	<0.001	49.3±11.6	47.0±10.3	<0.001	48.0±11.5	50.3±11.0	<0.001	48.9±11.4
Mean score of knowledge for main food groups	27.0±18.3	22.9±16.4	<0.001	25.4±17.7	22.9±16.7	<0.001	23.8±17.0	26.4±17.7	<0.001	24.97±17.5
Mean score of knowledge for main meals	60.2±27.4	58.6±28.1	0.047	59.4±27.9	59.1±27.2	0.782	56.6±27.8	63.5±27.3	<0.001	59.4±27.8
Mean score of knowledge for minerals and vitamins	29.4±23.4	25.8±21.9	<0.001	27.5±22.9	27.8±22.0	0.781	26.7±30.0	28.6±22.4	0.005	27.6±22.7
Mean score of knowledge for nutritional habits	69.2±12.1	67.0±12.4	<0.001	68.7±12.4	65.2±11.6	<0.001	67.54±12.6	69.0±11.75	<0.001	68.1±12.3
Mean score of practice for daily consumption of food groups	84.6±11.4	87.0±10.2	<0.001	86.0±10.8	85.0±11.5	0.005	86.8±10.5	84.2±11.3	<0.001	85.8±10.9
Mean score of practice for food consumption according to defined standards	56.3±14.00	54.5±15.0	<0.001	55.6±14.7	54.5±13.6	0.078	56.3±14.4	53.9±14.7	<0.001	55.4±14.6

Table 3: Comparison of average daily intake of distinct food groups among students in terms of gender, living area, and educational level

	Female	Male	P	Urban	Rural	P	Elementary school	Junior high school	P	Total
Average daily consumed serving of bread and cereal group	7.1±2.0	7.7±2.1	<0.001	7.4±2.1	7.4±2.1	0.908	7.2±2.0	7.7±2.1	<0.001	7.4±2.1
Average daily consumed serving of fruits group	2.3±1.2	2.0±1.3	<0.001	2.2±1.2	2.1±1.3	0.097	2.2±1.2	2.1±1.3	0.074	2.1±1.2
Average daily consumed serving of vegetables group	1.1±0.6	1.0±0.7	<0.001	1.0±0.7	0.9±0.6	<0.001	1.1±0.7	1.1±0.6	0.423	1.0±0.7
Average daily consumed serving of milk and dairy group	0.8±0.6	0.8±0.6	0.755	0.8±0.6	0.7±0.5	0.009	0.8±0.6	0.7±0.6	0.004	0.8±0.6
Average daily consumed serving of the meat group	3.4±1.3	3.5±1.2	0.008	3.5±1.2	3.2±1.2	<0.001	3.4±1.2	3.6±1.2	0.001	3.5±1.2
Average daily consumed serving of fats group	6.1±2.5	6.3±2.4	0.032	6.2±2.4	6.3±2.5	0.489	6.0±2.4	6.6±2.4	<0.001	6.2±2.4
Average daily consumed serving of sugars group	1.3±1.1	1.3±1.1	0.906	1.3±1.2	1.3±1.1	0.684	1.3±1.1	1.4±1.2	0.144	1.3±1.1

Table 4: Comparison of prevalence distribution of consumption of meals among students in terms of gender, living area, and educational level

	Female		Male		P		Urban		Rural		P		Elementary school		Junior high school		Total (%)	
	Not eaten at all (%)	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	Not eaten at all	Eaten in all 3 days	P	Total (%)
Breakfast	0.6	86.1	1.0	87	0.359	0.8	86.3	1.0	87.8	0.254	0.9	87.8	0.8	84.3	<0.017	86.6		
Before-noon snack	2.5	68.5	4.5	59.2	<0.001	3.5	63.4	3	66.7	0.461	2.8	67.3	4.6	58	<0.001	63.9		
Launch	0.1	95.1	0.1	93.7	0.0047	0.1	94.3	0.2	94.8	0.615	0.6	94.9	0.2	93.6	0.077	94.4		
Afternoon snack	5.6	73.4	8.4	68.3	<0.001	6.6	71.6	8.7	67.2	0.021	2.3	73.8	3.8	65.9	<0.001	70.9		
Dinner	0.1	89.7	0.1	90.8	0.581	0.1	89.9	0.0	91.8	0.434	0.1	91.7	0.2	88.1	0.005	90.2		
After-dinner snack	16.7	42.3	18.9	38.3	<0.001	16.1	39.9	15.9	42.5	0.517	15.1	42.5	17.6	36.5	0.004	40.3		

respectively, while they did not differ significantly between males and females ($P = 0.698$).

DISCUSSION

According to our findings mean values of nutritional knowledge score were lower than half of the total score, so it was not favorable in both female and male students as a whole. The most information of the students was recognized in the scope of nutritional habits whereas the poorest awareness was found in the scope of food groups, minerals, and vitamins. Compared to males, females were most aware in almost all aspects of nutritional knowledge evaluation, and this finding is corroborated in a number of previous surveys.^[11-14] Older pupils had higher levels of nutritional knowledge, which was mostly attributable to increased understanding of students when they were more trained and educated. Nevertheless, as with the previous studies, association between age and nutritional awareness was less consistent.^[15] Some studies have reported a direct correlation between age and nutritional awareness, whereas this correlation was inconstant with some other studies.^[12,13] Since rural students were considerably less aware of nutritional information more efforts, should be concentrated on educational program in rural areas. Nonetheless, higher awareness does not necessarily results in more favorable nutritional practice and behavior.^[12,13] For example, while females had higher levels of nutritional knowledge, they showed weaker nutritional attitudes regarding daily consumption of food meals and food groups in comparison with males. On one hand, it seems that some other influencing variables such as body image psychological issues, food preferences, family dietary pattern, environmental factors influencing on children and adolescents' nutritional behavior are accountable for this discrepancy.^[16,17] On the other hand, scientists implies that less favorable attitude of adolescent girls may be due to their inclination to lose weight and remain slim which affects their food choices and amount of daily intake, causing weaker behaviors regarding daily food consumption despite of enough knowledge and awareness in this field.^[10] Still, some female students had stronger performance, which is in accordance with the concept that conscious individuals pursue standard eating recommendations more often and less aware

people overrule recommended patterns of eating for daily consumption of food groups.^[15] This study also demonstrated that compared with junior high school students, primary school children were so susceptible to be influenced by family food pattern and parents' recommendations. In fact, younger children's food intake was more a reflection of parental choices and functions rather than their own knowledge-based behavior while adolescents and teenagers make more independent food choices. The level of control over food choices is higher in older children whereas in the case of preference for unhealthy foods, younger children have limited opportunity to choose, and parents encourage their children for healthy eating.^[18-20]

The results of this research demonstrated that males in primary school had higher intakes of meat, carbohydrates, and fats, but fruit, and vegetable intakes were significantly higher in female primary school students. Indeed, daily carbohydrate and protein intakes were appropriate, whilst the portion of fat was notably high, which was in accordance with the previous studies.^[21,22] However, consumption of some macro-nutrients in adolescents did not meet standard recommendations. In fact, the bread and cereals group met standard recommendation of FDA, whereas fat and oils, sugar intakes were higher than recommended daily amounts. Both males and females had low consumption of fruits, though its consumption was considerably lower in males. In general, this research and similar ones demonstrated that male participants had significantly lower consumption of vegetables and fruits and higher intakes of carbohydrates, fats, and meats in comparison to their female counterparts.^[23] Both males and females showed acceptable status for meal consumption except for venial individuals who missed main meals in spite of the fact that female participants showed a higher intake of meals, especially between-meal snacks.

CONCLUSIONS

This study indicates that adolescents had an imbalanced diet, which was not only considerably low in several essential food materials, but also high in some nutrients; however, they had acceptable nutritional knowledge.

Thus, necessity of developing nutritional interventions and education strategies aiming promotion of healthy eating habits in children is indispensable.

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