KenKyu

Diabetes, Obesity & Metabolic Disorders Open Access 2:31-34 (2016)

Research Article

Assessment of mineral intake in Adolescent School Children of Isfahan

Nourian M*, Maghsoudi Z, Shirani F

Food Security Research Center and Department of Community Nutrition, School of Nutrition and Food Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

Received February12, 2016; **Accepted** March 25, 2016; **Published** March 29, 2016

Abstract

Introduction: Adolescence is considered as a transitional stage between childhood and adulthood and it is one of the most important development periods which is accompanied by physical and mental puberty. Growth-related development coupled with rapid growth which rise their nutritional requirements and it can higher risks of malnutrition and irreversible outcomes which can lead to major risk factors in adulthood. The aim of this study is assessment of some of the nutritional and health status parameters of school-children

Material and Methods: In the present cross-sectional study, 313 female school-children were selected from different Iranian schools using systematic cluster sampling method. Anthropometric characteristics such as body weight, height and body mass index (BMI) were determined and these indices were compared with NCHS percentiles. Demographic characteristics and nutritional intake levels were assessed using standardized questionnaires. Three-days-24h-foodrecord questionnaires were prepared by a dietitian. Nutritional intake was compared with the recommended daily allowance (RDA) using SPSS software.

Results: Mean age of school-aged girls were 12.65±1.09 years nearly 77.6% of them were from families between 3 and 5 members. According to the research data 28.7% of the participants skipped their breakfast and their main meal as lunch.

Conclusion: Findings of this study revealed that insufficient intake of calcium, zinc, iron, retinol and vitamin D is the most outstanding nutritional problem, and, apart from the over-consumption of energy in adolescents, this problem raises serious concerns for care-givers and educational members of medical professionals.

Keywords: Nutritional assessment; anthropometric measurement; adolescence; childhood; Iran.

Introduction

School-aged children and adolescents are the future citizens of nations and, therefore, their health and nutritional status as the primary base for their physical and mental development can play essential roles in the social development of their countries and prevent the emergence of various economic and health-related problems in the future(1). This international concern, especially in developing countries, can be handled by continuing and expanding screening strategies for the early detection and treatment of community health problems(2). This age range is key stage which can establish specific patterns in diet and eating habits. Nutritional defects can have a detrimental and irreversible effect on the systematic growth of children and ultimately resultingrowth failure, malnutrition and possible disabilities(3). Nutritional status of school-aged children is a major determinant of tomorrow's health hazards. Risks of being overweight and obese, and their concomitant negative outcomes in adulthood are all influenced by body weight and health status of today's childrenand adolescents(4). Surveys show that nutritional deprivation has increased in this age group from 20% to 80%. So, it seems that emphasis on comprehensive health education programs can reflect desirable improvements in this area of concern (5). The discharging of this responsibility is in the hands of the health-care systems and its' managers . Program modification lies in clear records and evidences of cell satiety and nutritional status for preventing from health-threatening consequences. Under-nutrition, over-nutrition

***Corresponding Author:** NourianM, Food Security Research Center and department of Community Nutrition, Isfahan University of Medical Sciences, Isfahan, Iran. Tel: +03137922678; Fax:+03136681378; E-mail: nutritionist2020@yahoo.com

and nutrients deficiency in children and adolescents can be regarded as a major public health and community health problem in the coming years(6,7). So, predicting and designing proper strategies on improving the related socio-economic conditions and their intimate interactions in quality of life are important.

The present study tried to assess the nutritional status and nutrients' intake in female school-aged children and adolescents as the most vulnerable of at risk groupsproned to malnutrition, and also as the main gender in achieving and ensuring a healthy future in societies.

Material and Methods

Schoolchildren and adolescents of different Isfahanian schools participated in this cross-sectional study. They were selected using systematic cluster sampling method from all districts of Isfahan. Inclusion criteria were defined as being in three levels of high-school, without any disease history especially eating disorders, and without any history of taking medications and supplements. Adolescents who did not conform to performing the anthropometric measurements and those whodidnotproperlyanswerthequestionnaire'sitemswereeliminated fromthestudy. Body weight was assessed using a calibrated Seca Scale and their height was measured using an un-stretchable meter. BMI was calculated using the following formula: weigh(kg)/(height(m))2 Subjects' dietary intake was assessed using 24h-food record questionnaire filled out at home, carefully and after traininga certified dietitian. Food consumption over 2 workdays and one holiday were assessed. Food items and their amounts of food groups and their nutrients intake were determined using common household tools.Usual dietary intake was calculated by computing the average of three reports of food items and converting them to gram scale usingmodified version of NutIV softwareRecommended dietary allowance (RDA) guidelines were used as the standard reference to assess participants' adequacy of nutrients' intake and, their nutritional intake was compared with RDA.Nutrients' intake equal to or more than 75% of RDA amount was defined as sufficient intake, and if their consumption was lower than 75 % of recommended value set was defined as nutrient deficiency. Mean and standard deviation (mean ± SD) of quantitative variables were computed using SPSS software (version 20.0; SPSS, Inc. Chicago, IL, USA).

Table1: Energy consumption according to ages

Age (Year) / Energy (Cal)	14	13	12	11
n	9	33	36	35
Mean	1729	1404	1561	1404
SD	624.8	506.5	535.6	365.8
Min	744	635.6	804.3	667
max	1698	2633	2506	2142

Results

Energy consumption according to ages and the comparison of energy consumption with RDA according to different ages are shown in Table1 and Table2. Nutritional assessment of participants showed that their calcium intake in most of them was less than RDA values. The amount of daily calcium intake in all of four age groups waslower than 75% of the recommended amount for all age groups, most of the students consumed the smallest amount of the foregoing nutrients. A higher percentage of students in the 11-year-olds group had inadequate intake of calcium; while 12-year-olds received more calcium amount than the RDA level. The assessment of their phosphorus intake reflects that out of 313 participants, nearly 44.4% of girls consumed less than 75% of RDA amount, and the number of those who received more than RDA values was higher than other ages. A greater number of eleven-year-old students were in the category of insufficient intake compared to 14-year-old individuals. The average magnesium intake of students was approximately higher than RDA values compared with other reported minerals. Results showed that 22.8-55.5% of students consumed less than 75% of RDA values. Among all of the girl subjects, 37.5% were in category of receiving inadequate quantities of nutrients, and the prevalence of nutrients inadequacy was in the range of 24.2-66.6% of participants. The reported inadequacy of zinc intake was found in 28.6% of students, and zinc intake levels were similar in different groups. The only notable exception was found in 14-year-old children.

Discussion

Data showed that intake of calcium, phosphorus, magnesium, iron and zinc was less than RDA levels, in school-aged children. The results of this study were similar to the findings of Fallah et al.study (6) They examined 150 school-aged girls and boys, and observed thatDamghanian adolescents had inadequate intake of calcium and zinc(6). Deficiency of these two minerals consumption observed in 448 Tehranian female students between 14-18 years of age. Low intake of iron and calcium as the main mediators of cells'

Table 2: The comparison of energy consumption with RDA according to different ages

	Age(year)	Percent(%)	Age(year)	Percent(%)	Age(year)	Percent(%)	Age(year)	Percent(%)
n	100	9	100	33	100	36	100	35
RDA	%	14	%	13	%	12	%	11
74.9>	44.4	3	66.7	22	41.6	15	54.3	19
75-99.9	22.2	2	12.1	4	27.8	10	43.3	12
<100	33.3	3	21.2	7	30.6	11	11.4	4

Table 3: Average daily mineral intake of adolescent children

n(%)	50 (15.9)	103(33)	99 (31.6)	61 (19.5)
Calcium (mg)	733.1±304.3*	983.6±470.2	889.8±506.1	923.4±434.7
Calcium percentile				
<74.9	27 (77.2)	16 (44.5)	13 (72.7)	1 (55.5)
75-99.9	7 (20)	11 (30.6)	3 (9.1)	2 (22.2)
>100	1 (2.9)	9 (25)	6 (18.2)	2 (22.2)
phosphorous (mg)	999.40±320.85	1221.2±485.54	1085.3±511.81	1084.3±493.23
phosphorous percentile				
<74.9	19 (54.3)	10 (27.7)	11 (51.5)	4 (44.4)
75-99.9	9 (25.7)	11 (30.6)	8 (24.2)	2 (22.2)
>100	7 (20)	15 (41.7)	8 (24.2)	3 (33.3)
Magnesium (mg)	218.9±58.5	261.1±94.3	236.9±109.2	264.3±118.6
Magnesium percentile				
<74.9	8 (22.8)	10 (27.8)	13 (39.4)	2 (55.5)
75-99.9	15 (42.9)	5 (13.9)	8 (24.2)	2 (22.2)
>100	12 (34.3)	21 (58.3)	12 (36.4)	2 (22.2)
Iron (mg)	7.33±2.03	8.44±2.90	8.16±2.71	8.9±4.65
Iron percentile				
<74.9	10 (28.6)	11 (30.6)	8 (24.2)	6 (66.6)
75-99.9	13 (37.1)	5 (13.9)	8 (24.2)	1 (11.1)
>100	12 (43.3)	20 (55.6)	17 (51.5)	2 (22.2)
Zinc (mg)	7.87±2.41	8.23±3.25	8.12±3.70	8.05±4.54
Zinc percentile				
<74.9	7 (20)	10 (27.8)	11 (33.4)	3 (33.3)
75-99.9	9 (25.7)	10 (27.8)	9 (27.3)	3 (33.3)
>100	19 (54.3)	16 (44.4)	13 (39.4)	3 (33.3)

metabolism has also been observed in another cross-sectional study which was performed on 394 school-aged children in Nigeria (8). Distribution of nutrients' deficiency estimated using 24-hour food records of elementary-school-aged children in rural and urban areas of India reveal that calcium deficiency was found in 76% and 1.3% of children in rural and urban regions, respectively; while iron intake inadequacy was reported in 42% and 70% of students of this geographical areas, respectively(9).The evaluation of diet quality of American children indicated that high school-aged female adolescents had the highest level of insufficiency in minerals' intake, and 15% of the participants consumed smalleramounts of magnesium and phosphorus(10).

In a nutritional assessment study on one-hundred schools children revealed that iron and calcium intake of participants were significantly lower than RDA levels (11). Studies showed that nutrients' deficiency, especially calcium, zinc and iron, is major and serious problems in adolescents' diets. The essential roles of these nutrients in cells metabolism raise the necessity of performing educational programs and designing proper economic strategies to screen, prevent and manage nutrition-related problems. Average daily mineral intake of adolescent children is shown in Table3.

Conclusion

In conclusion, our study showed that intake of calcium, zinc, iron, retinol and vitamin D are the most common insufficient daily intake of school aged children. Despite over intake of energy, this insufficient intake highlights the necessity of arranging learning programs about proper food choice and focus on practical solutions.

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