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Preventive Medicine 39 (2004) 760–766
Preventive Medicine
www.elsevier.com/locate/ypmed

# Dietary fat intake and lipid profiles of Iranian adolescents: Isfahan Healthy Heart Program–Heart Health Promotion from Childhood

Roya Kelishadi, M.D.,[a,*] Mahin Hashemi Pour, M.D.,[b] Nizal Sarraf Zadegan, M.D.,[c] Manijeh Kahbazi, M.D.,[d] Gholamhosein Sadry, Ph.D.,[e] Amad Amani, M.D.,[f] Rezvan Ansari, M.S.,[a] Hassan Alikhassy, M.S.,[g] and Nasrollah Bashardoust, Ph.D.[h]

[a] *Preventive Pediatric Cardiology Department, Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences, Isfahan, Iran*
[b] *Pediatric Endocrinology Department, Isfahan University of Medical Sciences, Iran*
[c] *Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences, Iran*
[d] *Arak University of Medical Sciences, Iran*
[e] *Isfahan Provincial Health Office, Isfahan University of Medical Sciences, Iran*
[f] *Provincial Health Office, Arak University of Medical Sciences, Iran*
[g] *Nutrition Department, Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences, Iran*
[h] *Health Faculty, Isfahan University of Medical Sciences, Iran*

Available online 12 April 2004

**Abstract**

*Objectives.* To assess the serum lipid profiles of Iranian adolescents and their correlation with dietary fat intake and to evaluate the knowledge, attitude, and practice (KAP) of students, parents, and school staff.

*Methods.* The subjects of this cross-sectional study were 2000 students (1000 girls and 1000 boys), ages 11–18 years, selected by multistage random sampling, and one of their parents (2000 subjects), as well as 500 school staff in urban and rural areas of two provinces in Iran (one for further interventions and the other for reference).

The data were obtained by questionnaires, anthropometric measurements, 3-day food record form, and a 20-item food frequency questionnaire (FFQ). All serum lipids were determined in the same laboratory.

*Results.* Although the percentage of fat intake (21.2 ± 0.4%) among the adolescents was within the recommended daily allowance (RDA ≤ 30%), in most cases, the percentiles of serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglyceride (TG) were significantly higher and the percentiles of high-density lipoprotein cholesterol (HDL-C) were lower than standard values according to Lipid Research Clinics (LRC) data; for example, the mean TC values for girls in the 11- to 14- and 15- to 18-year age groups were significantly higher than LRC standard values (169 and 172 vs. 160 and 159 mg/dl, respectively, $P < 0.05$). This difference was also significant in boys (167 and 168 vs. 160 and 153 mg/dl, respectively) at the $P < 0.05$ level.

A significant linear association was shown between adolescents' dyslipidemia and the frequency of intake of hydrogenated fat, fast foods, cheese puffs, and potato chips ($P < 0.05$).

Although the protein intake was lower than the RDA (13.4 ± 0.9% vs. 15%, $P < 0.05$), because of the highly prevalent consumption of fatty lamb meat, the frequency of red meat intake had a direct association with dyslipidemia ($P < 0.05$).

*Conclusion.* The improper intake of high amounts of saturated fat and the observed serum lipid profile of Iranian adolescents are likely placing them at increased risk for cardiovascular disease (CVD) and necessitate developing guidelines and community-based interventions.


*Keywords:* Dietary fat intake; Lipid profile; Adolescents; Quality of fat; Knowledge; Attitude; Practice; Cardiovascular disease risk

## Introduction

Long-term follow-up studies have demonstrated tracking of cardiovascular disease (CVD) risk factors from childhood into adult life, and dietary fat consumption in childhood is one of these risk factors that can have a long-term effect on adult health, particularly the risk of CVD [1].

* Corresponding author. Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences, P.O. Box 81465-1148, Isfahan, Iran. Fax: +98-311-3373435.
*E-mail address:* Kelishadi@med.mui.ac.ir (R. Kelishadi).


doi:10.1016/j.ypmed.2004.02.047

Table 1
Subject characteristics of intervention and reference considered provinces (before intervention)

| Variable | Intervention considered area (mean ± SD) | | | Reference considered area (mean ± SD) | | |
|---|---|---|---|---|---|---|
| | Urban ($n$ = 700) | Rural ($n$ = 300) | $P$ value | Urban ($n$ = 600) | Rural ($n$ = 400) | $P$ value |
| Age (years) | 14.1 ± 1.2 | 14.5 ± 1.1 | NS | 14.2 ± 1.2 | 14.4 ± 1.2 | NS |
| Weight (kg) | 51.3 ± 11.8 | 49.17 ± 11.8 | NS | 48.5 ± 12.3 | 46.8 ± 10.3 | 0.03 |
| Height (cm) | 160.1 ± 16.9 | 157 ± 18.8 | 0.01 | 155.4 ± 13 | 156.9 ± 12.05 | NS |
| TC[a] (mg/dl) | 160.8 ± 35.7 | 163.7 ± 31.8 | NS | 163.01 ± 32.2 | 164.4 ± 33.4 | NS |
| LDL-C[b] (mg/dl) | 84.8 ± 32.7 | 86.0 ± 27.7 | 0.03 | 93.4 ± 31.1 | 98.1 ± 30.0 | NS |
| HDL-C[c] (mg/dl) | 52.8 ± 10.5 | 52.2 ± 10.9 | NS | 46.1 ± 16.9 | 45.3 ± 11.3 | NS |
| TG[d] (mg/dl) | 117.0 ± 50.5 | 131.09 ± 55 | NS | 122.4 ± 44.4 | 115 ± 51.2 | NS |

[a] Total cholesterol.
[b] Triglyceride.
[c] Low-density lipoprotein cholesterol.
[d] High-density lipoprotein cholesterol.

Prevention of CVD through intervention in early childhood is important because dietary habits and food preferences are formed early in life and diets consumed by families tend to persist in the next generation [2].

Different populations have different eating habits and chronic adult disease rates. Hence, recommendations to restrict dietary fat intake vary among populations [3].

However, higher serum total cholesterol (TC) concentrations in children from different countries are associated with higher TC concentrations in adults in the same country and with higher CVD mortality rates [4].

Population data on TC show that modification of dietary habits and food preferences of children and adolescents has been able change lipid profiles in developing nations and even in Third World countries. Recent studies show that TC in children in different countries, for instance in Japan and Spain, exceeded the 75th percentile for U.S. children [5–7], while the intake of fat by American children has declined over the past two decades but still remains above 30% of total caloric intake [8]. On the basis of an eight-province survey, the fat intake by Chinese children rose from 17% in 1989 to nearly 30% in 1993 [9]. The dietary fat intake by Chinese children in Hong Kong was both quantitatively and qualitatively different from the traditional Chinese diet [10]. A relationship between the quality of fat intake and hyperlipidemia has been shown, and studies have suggested that modifications in childhood lipid profiles could be due to switching from traditional diets to those that are characteristic of industrialized countries [10–15]. Thus, public health policy plays an important role in pointing to the link between dietary fat intake and serum lipid levels in children and adolescents.

In Iran, the prevalence of CVD and associated risk factors increased and the age of onset of CVD among the population has decreased [16]. In addition, the prevalence of these risk factors, particularly hyperlipidemia and obesity,

Table 2
Frequency of adolescents' food intake (times/week) (before intervention)

| | Intervention considered area | | | Reference considered area | | |
|---|---|---|---|---|---|---|
| | Urban ($n$ = 700) (mean ± SD) | Rural ($n$ = 300) (mean ± SD) | $P$ | Urban ($n$ = 600) (mean ± SD) | Rural ($n$ = 400) (mean ± SD) | $P$ |
| Red meat | 3.04 ± 1.69 | 2.8 ± 1.69 | NS | 3.6 ± 2 | 3.8 ± 1.9 | NS |
| Chicken | 2.01 ± 0.6 | 1.5 ± 0.4 | NS | 1.8 ± 0.6 | 1.8 ± 0.4 | NS |
| Fish | 0.7 ± 0.1 | 0.6 ± 0.2 | NS | 0.9 ± 0.5 | 0.6 ± 0.3 | NS |
| Soy | 0.9 ± 0.2 | 0.7 ± 0.4 | NS | 1.1 ± 0.4 | 0.8 ± 0.4 | NS |
| Deep-fried food | 3.4 ± 1.1 | 3.3 ± 1.3 | NS | 4.1 ± 1.7 | 4.3 ± 1.1 | NS |
| Dairy products | 5.9 ± 2.7 | 5.9 ± 2.1 | NS | 5.5 ± 2.3 | 6.1 ± 2.1 | 0.001 |
| Bread | 10.3 ± 3.6 | 11.8 ± 3.05 | NS | 11.9 ± 3.9 | 15.03 ± 3.5 | 0.001 |
| Rice | 5.8 ± 1.9 | 5.5 ± 1.3 | NS | 6.2 ± 1.4 | 6.08 ± 1.6 | NS |
| Potato | 3.6 ± 0.9 | 2.8 ± 0.4 | NS | 4.7 ± 0.7 | 4.5 ± 0.7 | NS |
| Cereal | 3.4 ± 1.4 | 3.9 ± 1.9 | NS | 4.7 ± 1.4 | 4.7 ± 1.3 | NS |
| Vegetables | 5.3 ± 1.4 | 5.4 ± 1.0 | NS | 5.3 ± 1.5 | 5.3 ± 1.7 | NS |
| Fruits | 6.8 ± 2.0 | 5.1 ± 2.3 | 0.02 | 6.7 ± 2.5 | 5.2 ± 2.6 | 0.05 |
| Salad | 3.8 ± 0.9 | 3.3 ± 1.1 | NS | 4.3 ± 1.0 | 3.6 ± 1.0 | NS |
| Pizza | 0.7 ± 0.5 | 0.3 ± 0.4 | NS | 0.2 ± 0.8 | 0.2 ± 0.7 | NS |
| Other fast foods | 1.9 ± 0.4 | 0.8 ± 0.2 | 0.02 | 1.02 ± 0.2 | 0.7 ± 0.2 | 0.00 |
| Cheese puffs and potato chips | 3.8 ± 0.7 | 2.1 ± 0.6 | NS | 4.1 ± 0.8 | 3.2 ± 0.9 | NS |
| Chocolate | 3.6 ± 0.8 | 1.7 ± 0.4 | 0.00 | 3.5 ± 0.6 | 1.6 ± 0.5 | 0.001 |
| Nuts | 1.2 ± 0.1 | 1.1 ± 0.1 | NS | 1.3 ± 0.2 | 1.09 ± 0.1 | NS |
| Biscuits | 2.8 ± 0.7 | 2.2 ± 0.3 | NS | 2.6 ± 0.5 | 2.6 ± 0.5 | NS |

has rapidly increased among children and adolescents in recent years [17].

Given the change in TC during childhood in populations who are rapidly undergoing westernization of their lifestyles, the present study was performed in 2001 in Iran with the aim of identifying potential modifiers of serum lipids among children and adolescents. Such identification will be very important in designing effective intervention and prevention programs aimed at reducing CVD risk by both population and individualized approaches.

## Subjects and methods

This cross-sectional study was performed as the baseline evaluation of a project named Heart Health Promotion from Childhood (HHPC), part of a community-based intervention program called Isfahan Healthy Heart Program (IHHP). This is a comprehensive, integrated, community-based program for CVD prevention and control, evaluating the outcome of different interventions in a given province in comparison to a reference area [18]. Two provinces with nearly similar socioeconomic and cultural status have been selected for this purpose: Isfahan and Arak. During the second phase, interventions are being carried out only in Isfahan based on the results of the first phase, while Arak remains without intervention as the reference area. After 5 years (2005), the post-intervention outcomes will be evaluated and compared for the two provinces. The present data reflect the situation before interventions (2001).

The population studied by the HHPC is comprised of 2000 students (1000 girls and 1000 boys), ages 11–18, and selected by multistage random cluster sampling from 56 middle and high schools of urban and rural areas. These areas were defined according to the national population distribution census in 1999. Regarding the population distribution in intervention and reference provinces, the urban/rural ratio of the subjects studied was 70/30 and 60/40, respectively. Initially, census blocks based on data of the Iranian Ministry of Health were randomly selected. Then, schools were randomly selected from different clusters of these blocks, and student selection within schools was also at random.

The principal, the superintendent, the students' counselor, the health care professional, the exercise instructor, and four randomly selected biology teachers in each school filled out the questionnaire. Responses from one parent of each student (2000 samples) and from 500 members of the school staff have also been studied. Written informed consent was obtained from parents after full explanation of the procedure involved. Consent forms were distributed in schools among pupils so that they could take them home. When the response rates in the intervention and reference provinces were 92% and 90%, respectively, sampling was continued to reach the stated number of subjects. The field examinations of the survey were carried out by a team of expert nurses, especially trained for this task for 1 week. All

Table 3
Serum lipids (mg/dl) in adolescents (1000 girls and 1000 boys) in comparison with standard values*

| Age group (years) | 50th percentile | | 75th percentile | | 95th percentile | |
|---|---|---|---|---|---|---|
| | Obtained | Standard | Obtained | Standard | Obtained | Standard |
| *Total cholesterol* | | | | | | |
| 11–14 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 169 | 160 | 196 | 171 | 232 | 205 |
| Boys ($n$ = 500) | 167 | 160 | 198 | 173 | 230 | 202 |
| 15–18 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 172 | 159 | 201 | 176 | 236 | 207 |
| Boys ($n$ = 500) | 168 | 153 | 199 | 168 | 232 | 191 |
| *LDL-C* | | | | | | |
| 11–14 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 105 | 97 | 126 | 110 | 160 | 136 |
| Boys ($n$ = 500) | 107 | 97 | 122 | 109 | 158 | 132 |
| 15–18 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 105 | 96 | 124 | 111 | 162 | 137 |
| Boys ($n$ = 500) | 102 | 94 | 120 | 109 | 160 | 130 |
| *Triglyceride* | | | | | | |
| 11–14 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 110 | 72 | 155 | 85 | 230 | 120 |
| Boys ($n$ = 500) | 100 | 63 | 142 | 74 | 205 | 111 |
| 15–18 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 104 | 73 | 148 | 85 | 210 | 126 |
| Boys ($n$ = 500) | 105 | 78 | 124 | 88 | 219 | 143 |
| | 5th percentile | | 50th percentile | | 95th percentile | |
| *HDL-C* | | | | | | |
| 11–14 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 33 | 37 | 43 | 52 | 53 | 70 |
| Boys ($n$ = 500) | 32 | 37 | 42 | 55 | 50 | 74 |
| 15–18 ($n$ = 1000) | | | | | | |
| Girls ($n$ = 500) | 34 | 35 | 44 | 52 | 54 | 74 |
| Boys ($n$ = 500) | 32 | 30 | 43 | 46 | 51 | 63 |

* Standard values: Data from Lipid Research Clinics Population Studies Data Book, vol. 1, The Prevalence Study. NIH publication No 80-1527, Washington, DC, National Institutes of Health, 1980.

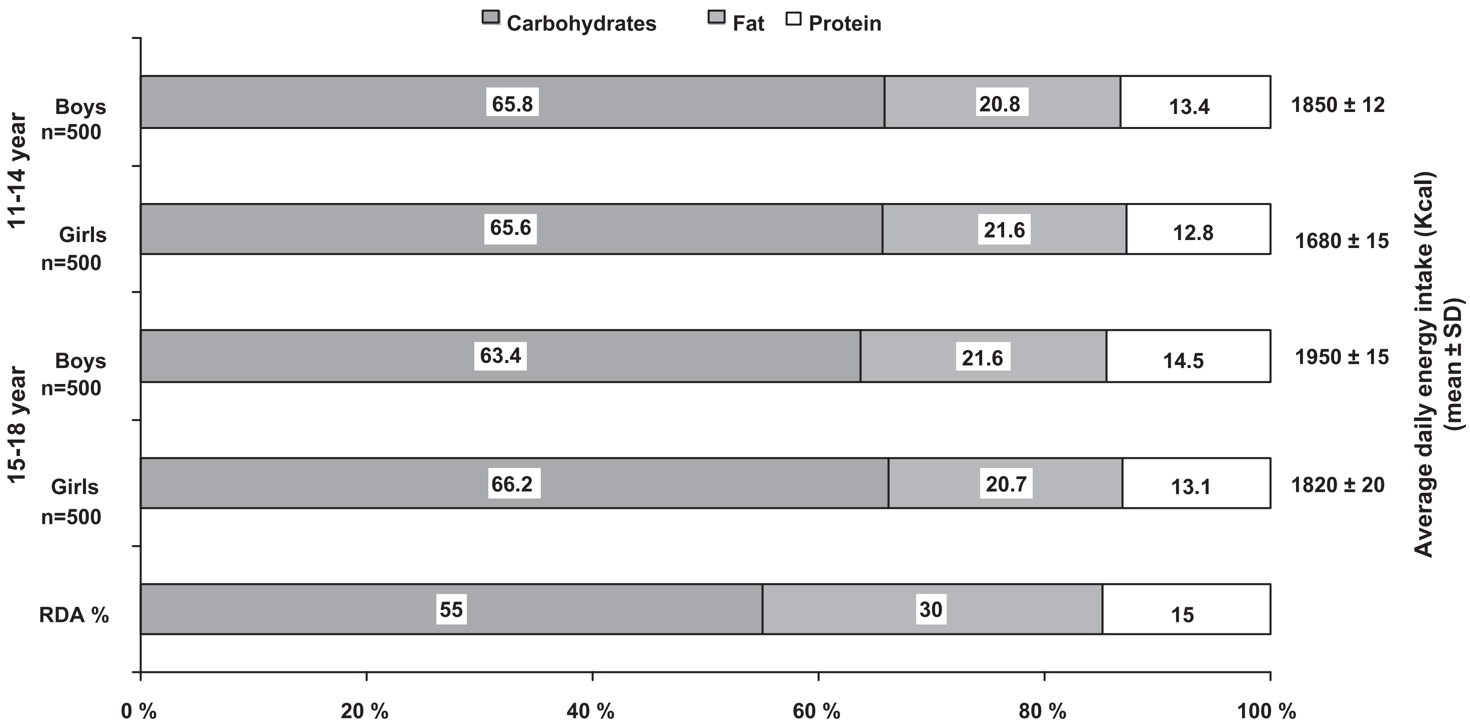


Fig. 1. The percentage of adolescents' daily energy derived from carbohydrate, protein, and fat, based on a 3-day food record questionnaire (1000 girls and 1000 boys).

instruments were standardized before the examination and the balances were zero-calibrated.

Three structured questionnaires (for students, parents, and school staff) were prepared; the validity of their content was affirmed based on observations by a panel of experts from the Research Method Committee and Research Council of Isfahan Cardiovascular Research Center (a WHO collaborating center).

Item analysis and reliability measures were assessed based on the response of 100 students, 50 parents, and 50 school staff. The Cronbach alpha reliability coefficients for the questionnaires of the students, parents, and school staff were 0.71, 0.72, and 0.75, respectively.

The students and school staff filled out the questionnaires at schools under the supervision of the trained nurses. A 20-item food frequency questionnaire (FFQ) was also completed by the students. The parents' questionnaire and a 3-day food record form (one week-end day and two week days) were given to pupils at school to be taken home and returned to schools. The questionnaire was completed by either father or mother, and the food record was filled in by the parent and student together. Physical examinations and venous blood sampling (after ≥12 h fasting) were scheduled from 8:00 to 9:30 AM during the school days. After blood sampling, students received a healthy snack.

The age and birth date were recorded. The weight was measured to the nearest 200 g with subjects being lightly dressed and barefoot and standing height to the nearest 0.2 cm.

The blood samples were centrifuged for 10 min at 3000 rpm, sera were frozen (−20°C), and transported to the laboratory at the Isfahan Cardiovascular Research Center, which is under the quality control of St. Rafael University, Department of Epidemiology, Leuven, Belgium.

TC, high-density lipoprotein cholesterol (HDL-C) and triglyceride (TG) were measured by an enzymatic method using an Elan 2000 autoanalyzer (Ependorf, Germany). Low-density lipoprotein cholesterol (LDL-C) was calculated (in serum samples with TG ≤ 400 mg/dl) according to the Friedewald formula [19]. Nutritional assessment was made by means of the 3-day food record and the FFQ. Quality control measures and verification of home recipes were also undertaken. The data concerning dietary intake were evaluated and analyzed by an expert nutritionist.

### *Statistical analyses*

The data were collected and stored in a computer database. The recorded information was checked for missing values and data entry errors. All missing or doubtful data were checked once more by returning the questionnaire to respective schools. After tidying up the data, statistical analyses were performed using the SPSS statistical package version 10 for Windows (SPSS Inc., Chicago, USA). The mean values of all factors were compared using unpaired Student's *t* test. Yates corrected $x^2$ tests were used to compare the respective frequencies. Linear regression analysis of serum lipids was performed in relation to the food consumption frequencies. The significance of differences was defined at $P < 0.05$.

## Results

The characteristics of the subjects are depicted in Table 1. Evaluation of the knowledge of subjects about the best type of oil and the healthiest type of food preparation showed that 47.7% of students, 48.2% of parents, and 50.4% of school staff in both provinces agreed that liquid vegetable oils are best and deep-frying food is not a proper way of cooking. Hydrogenated solid fat was the most prevalent type of fat consumed by all families in this study; 67.4% of the people in urban areas and 79.4% of those in rural areas of Isfahan province, and 67.7% in the urban areas, and 78.8% in the rural areas of Arak consumed hydrogenated fat. The percentages for liquid oil—mostly consisting of polyunsaturated types as soybean and sunflower oils—were 20.2% and 14% in Isfahan province as well as 17.5% and 9.4% in Arak, respectively.

The students did not receive lunch or breakfast at school; the frequency of their weekly food intake (Table 2) shows that most of the students consumed deep-fried food more than three times per week. Cheese puffs and potato chips were the most consumed snacks in urban and rural areas of both provinces.

The percentile distribution of serum lipid levels by comparison to the standard values according to Lipid Research Clinics (LRC) data are presented in Table 3. In all cases, the 50th, 75th, and 95th percentiles of TC, LDL-C, and TG were higher, and the 5th, 50th, and 95th percentile of HDL-C were lower than the corresponding levels of LRC standard values.

Fig. 1 shows the percentages of energy intake derived from carbohydrates, protein, and fat among the subjects studied. In all studied groups, the energy derived from carbohydrates was higher than the recommended daily allowance (RDA) and that from fat was within the RDA.

Table 4
Linear association between frequency of food intake (time/week) and serum lipids

| | TC[a] | | TG[b] | | LDL-C[c] | | HDL-C[d] | |
|---|---|---|---|---|---|---|---|---|
| | *β*[e] | *P* | *β* | *P* | *β* | *P* | *β* | *P* |
| Red meat | 0.04 | 0.04 | 0.04 | 0.03 | 0.02 | 0.07 | −0.05 | 0.02 |
| Chicken | 0.02 | 0.06 | 0.01 | 0.08 | 0.01 | 0.09 | 0.01 | 0.4 |
| Fish | 0.02 | 0.08 | 0.01 | 0.1 | 0.01 | 0.8 | 0.02 | 0.07 |
| Soy | 0.01 | 0.07 | 0.02 | 0.9 | 0.02 | 0.1 | 0.02 | 0.09 |
| Deep fried food | 0.05 | 0.04 | 0.04 | 0.04 | 0.05 | 0.03 | 0.01 | 0.8 |
| Dairy products | 0.02 | 0.06 | 0.02 | 0.1 | 0.01 | 0.2 | 0.02 | 0.1 |
| Bread | 0.01 | 0.1 | 0.01 | 0.8 | 0.02 | 0.1 | 0.01 | 0.7 |
| Rice | 0.02 | 0.07 | 0.06 | 0.02 | 0.02 | 0.07 | 0.02 | 0.08 |
| Potato | 0.01 | 0.9 | 0.01 | 0.07 | 0.01 | 0.2 | 0.01 | 0.2 |
| Fast foods | 0.04 | 0.03 | 0.06 | 0.03 | 0.02 | 0.09 | −0.04 | 0.03 |
| Fat/salty snacks | 0.05 | 0.03 | 0.05 | 0.04 | 0.01 | 0.1 | −0.04 | 0.04 |

[a] Total cholesterol.
[b] Triglyceride.
[c] Low density lipoprotein cholesterol.
[d] High density lipoprotein cholesterol.
[e] Regression coefficient.

The data on the educational level of parents and the type of fat consumed in family were analyzed using the Kruskal–Wallis test, showing significant correlation ($P < 0.001$). However, there was no significant correlation between the knowledge, attitude, and practice (KAP) of the school staff and the KAP of the students ($r = 0.17$, $P = 0.08$).

The linear association between eating behavior, that is, frequency of intake of food, and serum lipids is presented in Table 4 and shows significant association between the frequency of intake of red meat, deep fried food, fast foods, fat/snacks, and dyslipidemia.

## Discussion

The existing evidence strongly supports a mandate for primary prevention of atherosclerotic disease to begin in childhood [20]. The dietary fat intake of children and adolescents plays an important role in their growth and development, and also has a long-term effect on adult health. For this reason, both quantity and quality of dietary fat are important [21].

The present study shows an undesirable lipid profile of the adolescents even though their dietary fat intake is within RDA limits. This finding emphasizes the importance of fat quality along with its quantity.

As the Bogalusa Heart Study on the relationship between the diet of children and CVD risk factors has shown tracking of dietary components, this enables the detection of CVD risk factors already during infancy [22]. Similarly, the study of Gliksman et al. [12], performed on 5,211 Australian school children aged 10–15 years, has suggested that class differences in CVD risk arise from dietary differences present from an early age. In a cross-sectional analysis of the distribution and correlates of TC in children, Freedman et al. have found that the mean TC levels increased with age, and levels among 2-year olds approached those seen in adolescents; racial and ethnic differences in TC levels were also observed [15].

Consistent with studies performed in several other countries [6,7,9–11,23–25], we found that in our community too, rapid changes in lifestyle, especially the mass consumption of food with undesirable composition, and the lack of sufficient physical activity have contributed to lipid profiles that signal risk for CVD. Increased consumption of foods more typical of a western diet is displacing the intake of traditional foods, such as plant sterols and dietary fiber that are clearly having a role in lipid metabolism.

Despite the finding that students, parents, and school staff were aware of the benefits of liquid oils, hydrogenated fat was the most consumed fat. This can be mainly due to the considerably higher price of liquid oil.

A significant linear association was shown between the frequency of hydrogenated fat consumption with serum TC and TG; in addition, the higher percentiles of serum TC, LDL-C, and TG, as well as lower percentiles of HDL-C despite fat consumption within RDA, support this association.

The finding about this relationship is in agreement with the study in Spain [7,11] but not with that conducted in Japan [6,11]. Differences in genetic response to diet may explain these similarities and differences. Among dietary fatty acids, *trans* and saturated fatty acids have the worst effects on blood lipids. The adverse effects of *trans* fatty acids on TC and HDL-C agree with epidemiological findings of an increased risk of CVD as described by Ascherio [26]. In our community, there are still much saturated and *trans* fatty acids in the fats used at homes, in restaurants, and in various food industries. As shown in the present study, dyslipidemia in Iranian adolescents can be attributed mainly to improper dietary habits, especially in respect of fast foods and snacks that contain high levels of saturated and *trans* fatty acids, but are usually preferred to the traditional family meals and/or snacks.

Hypertriglyceridemia is suggested to be in part an effect of high carbohydrate intake, which in our study has been above the RDA in most adolescents. Inadequate activity and lack of exercise are also important contributors to the development of dyslipidemia in our society, where the range of physical activity of adolescents is low [27]. It is recommended therefore that age and culturally appropriate physical activity programs be instituted.

Although the protein intake was mostly below the RDA, an association was shown to exist between the frequency of red meat consumption and hyperlipidemia. This can likely be attributed to the fatty lamb as the commonly used meat in the families studied here. Encouraging families to use leaner meat and to increase soy consumption can improve the nutritional habits and can also help to raise the adolescents' protein intake toward the required level.

### *Limitations of the study*

The nutritional assessments of this study are based on FFQ and a 3-day food record form. The process of recalling and recording food intakes requires attention and involves perception, and underreporting is likely due to the participant's new awareness of the importance of diet and their ability to readily identify healthful and not so healthful foods; therefore, it is probable that some databases are unable to reflect the precise food intake. The most common variety of misreporting is underreporting. In addition, we wish to acknowledge that our data on serum lipids are compared with LRC data; these are not necessarily universally healthful standards but are nevertheless useful for comparative purposes in this study.

## Conclusion

Because of the importance of dietary practices, it is mandatory that remedial guidelines be developed specifically for each country. To be effective, such guidelines must consider the unique settings and local availabilities of food.

In developing countries, national planning should adjust for both inadequate food supplies and excesses, providing the appropriate quantity and quality of fat in the food supply. Community-based comprehensive nutrition policy requires a partnership between governments, industry, consumers, and mass media.

The now ongoing second phase of this study consists of different community-based interventions in Isfahan. After these interventions, the outcome evaluation and its comparison with the reference area will demonstrate the extent to which our goal will have been achieved.

## Acknowledgments

Isfahan Healthy Heart Program, Heart Health Promotion from Childhood (IHHP–HHPC), is supported by the grant No. 31309304 from the Iranian Budget and Programming Organization the Deputy of Health of the Ministry of Health, and Medical Education in the Islamic Republic of Iran, Isfahan Cardiovascular Research Center and Isfahan Provincial Health Center, both affiliated to Isfahan University of Medical Sciences. We thank the personnel of Isfahan and Arak Provincial Health offices and also the two provincial Education and Training offices for their cooperation. Also we thank Dr. Asgary, head of Basic Science Unit and Dr. Naderi, head of laboratories of Isfahan Cardiovascular Research Center, Dr. Ajami as the supervisor of laboratory and all members in the Computer Unit and laboratories of Isfahan Cardiovascular Research Center for their assistance.

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