# Association of physical activity and dietary behaviours in relation to the body mass index in a national sample of Iranian children and adolescents: CASPIAN Study

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**Objective** To examine the relation of dietary and physical activity (PA) patterns with the body mass index (BMI), and the associations between these patterns among children.

**Methods** A representative sample of 21,111 school children aged 6–18 years was selected by multistage random cluster sampling from 23 provinces in the Islamic Republic of Iran. PA and dietary pattern were assessed by self-administered validated questionnaires.

**Findings** Fruit and vegetables, dairy products and snacks (salty, fatty or sweet) had a similar consumption frequency of approximately twice a day. The type of fat most frequently consumed was hydrogenated solid fat (consumed by 73.8% of families). The PA level was significantly higher among boys than girls, in rural than in urban residents, and in intermediate students than high-school students. Among boys, the frequency of consumption of vegetables and plant proteins (R² = 0.46); and among girls, the frequency of consumption of dairy products and fruits, as well as high PA level had a significant inverse association with BMI (R² = 0.57). Among boys, the low frequency of consumption of fruits, the time spent on PA and the energy expenditure; and among girls, the time spent on PA and the energy expenditure, had significant relationships with overweight. When controlling for covariates, PA levels had significant relationships with the frequency of consumption of all food groups.

**Conclusion** Unhealthy lifestyles make Iranian young people prone to chronic diseases later in life. When examining their health benefits, the interrelationship of dietary and PA behaviours should be considered.


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**Introduction**

According to WHO estimates, by 2020, noncommunicable diseases (NCD) will account for approximately three quarters of all deaths in the developing world. Interest in childhood precursors to chronic diseases is increasing because the behavioural and biological risk factors for chronic diseases persist from childhood into adulthood.2–4 Declining levels of physical activity (PA) as well as nutrition transition (i.e. the trend towards increased consumption of a diet high in saturated fat, sugar and refined foods, and low in fibre) among communities are thought to be partly responsible for the rising rate of such risk factors worldwide.5–9

In this regard, a potential emerging public health concern in developing countries is likely to be the increasing incidence of childhood overweight, which in the future is likely to create an enormous public health burden.8

In recent years, in addition to problems in adults, the epidemiological transition has made Iranian young people prone to chronic diseases in later life.9–11

Although previous studies have determined the associations between PA and dietary habits in relation to overweight in developed countries, it is not clear if their findings can be generalized to other ethnic groups with very different cultures and lifestyles. Consequently, for the first time in the Islamic Republic of Iran, and to our knowledge for the first time in the WHO Eastern Mediterranean Region, a national-level baseline survey has been performed as part of the Childhood & Adolescence Surveillance and PreventIon of Adult Non-communucable disease: CASPIAN Study. The current paper used the baseline data from this large study to examine the associations between dietary and PA patterns, as well as their relation to the body mass index (BMI) among a nationally representative sample of children and adolescents.

**Methods**

This cross-sectional study was performed at the national level in 2003–04 in a

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joint collaboration supported by a grant from WHO/WHO Regional Office for the Eastern Mediterranean and by the Iranian National Ministry of Health (MoH) and Ministry of Education (MoE). It was a multicentre study performed among 21 111 school students (96% participation rate), aged 6–18 years, living in urban areas and in the rural areas surrounding the central cities of 23 (out of 28) provinces in the Islamic Republic of Iran.

Approval for the study was granted by ethics committees and other relevant national regulatory organizations. The Data and Safety Monitoring Board of the project closely supervised the quality control and quality assurance of the survey at the national level.

The project team obtained written informed consent from parents and oral assent from students. They selected school students by multistage random cluster sampling. Schools were stratified according to location (urban or rural), and the socioeconomic characteristics of their catchment area, taking into consideration the proportion of the different types of schools (public or private) to avoid socioeconomic bias.

Questionnaires in the Farsi language were prepared based on the questionnaires used in the WHO STEPwise approach to noncommunicable diseases (Tools version 9.5) and the WHO Global School-based Student Health Survey (GSHS). The questions concerning the sociodemographic characteristics, the child’s birth weight, and his or her feeding during infancy, as well as the family history of chronic diseases and family dietary habits were included in the parents’ questionnaire. Students filled in a validated food frequency questionnaire. The validity of our questionnaire’s content was affirmed by a panel of experts; item analysis and reliability measures were assessed in a pilot study.

The students’ PA pattern was assessed by the questionnaire in which nine different metabolic equivalent (MET) levels were ranged on a scale from sleep/rest (0.9 METs) to high-intensity physical activities (> 6 METs); this instrument was assessed by comparison with measurement of physical activity by accelerometry and keeping a PA diary. The questionnaire had previously been modified and validated among Iranian young people, and was found to be significantly associated with the results obtained using the International Physical Activity Questionnaire (IPAQ).

For each activity level, the MET-value was multiplied by the time spent at that particular level. The MET-time at each level was added to obtain a total over 24 hours MET-time, representing the PA level on an average weekday.

Energy expenditure was estimated by multiplying the total 24-hour MET-time by the body weight. In the current study, we categorized the PA level according to the tertiles computed in the population studied, and scored it from 1 to 3 corresponding to the 1st to the 3rd tertile.

Under the supervision of expert health care professionals, each student and one of the parents, who was invited to the school, filled in the self-administered questionnaire at the same time. The nurses recorded the student’s age, and measured height and weight using standard protocols. This instrument was assessed by comparison with measurement of physical activity by accelerometry and keeping a PA diary.

The data entry staff entered data for all forms and questionnaires twice and measured height and weight using standard protocols.

analyses of variance (ANOVA) were performed to determine significant interactions of PA level, age and BMI as the dependent variables, and gender, living area (urban versus rural) and BMI as the dependent variables; significant findings were further analysed using post hoc tests.

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Under the supervision of expert health care professionals, each student and one of the parents, who was invited to the school, filled in the self-administered questionnaire at the same time. The nurses recorded the student’s age, and measured height and weight using standard protocols. BMI was computed as weight in kilograms divided by the square of height in metres. The BMI cut-off points used were those from the Centers for Disease Control and Prevention (CDC).

The data entry staff entered data for all forms and questionnaires twice and checked for completeness and inconsistencies. The data checking process was conducted first at the district and then at the national level.

Statistical analysis

After editing, the data were analysed using the SPSS software package version 13.0 (SPSS, Inc. Chicago, IL). The relationship between the time spent watching television and/or at a computer with BMI was assessed by the Pearson correlation coefficient. The linear regression analysis was performed between BMI as the dependent variable and possible related variables. Odds ratios from logistic regression models were employed to evaluate the gender-specific associations of overweight with possible associated factors.

Analyses of variance (ANOVA) were performed to determine significant interactions of PA level, age and BMI as the dependent variables, and gender, living area (urban versus rural) and BMI as the dependent variables; significant findings were further analysed using post hoc tests.

Analyses of covariance (ANCOVA) were conducted that included PA level (tertiles) as the independent variable, and the weekly consumption of different food groups as the dependent variables.

### Table 1. Linear regression analysis of factors studied with the body mass index of a national sample of Iranian children and adolescents aged 6–18 years ($n = 21 111$)

<table>
<thead>
<tr>
<th>Sex</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong> ($n = 10 253$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>15.6</td>
<td>0.4</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>History of breastfeeding</td>
<td>−0.4</td>
<td>0.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>0.2</td>
<td>0.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Father’s education</td>
<td>0.2</td>
<td>0.09</td>
<td>0.04</td>
</tr>
<tr>
<td>Plant protein (times/week)</td>
<td>−0.08</td>
<td>0.02</td>
<td>0.001</td>
</tr>
<tr>
<td>Vegetables* (times/week)</td>
<td>−0.05</td>
<td>0.02</td>
<td>0.005</td>
</tr>
<tr>
<td>Positive family history of obesity*</td>
<td>0.2</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Rural residence</td>
<td>−0.9</td>
<td>0.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Girls</strong> ($n = 10 858$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>13.3</td>
<td>0.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>History of breastfeeding</td>
<td>−0.5</td>
<td>0.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mothers’ education</td>
<td>0.2</td>
<td>0.07</td>
<td>0.01</td>
</tr>
<tr>
<td>Positive family history of obesity</td>
<td>0.2</td>
<td>0.04</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Fruits* (times/week)</td>
<td>−0.06</td>
<td>0.01</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>High physical activity level*</td>
<td>−0.3</td>
<td>0.1</td>
<td>0.002</td>
</tr>
<tr>
<td>Dairy product (times/week)</td>
<td>−0.03</td>
<td>0.01</td>
<td>0.007</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.3</td>
<td>0.1</td>
<td>0.04</td>
</tr>
</tbody>
</table>

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*a Potatoes and chips not included. 
*Parents, grandparents, aunts, uncles. 
*Fresh, dried, juice. 
*3rd tertile of physical activity.
after controlling for BMI, age, gender and living area. Significant findings were further examined by linear regression models in which consumption of different food groups provided the dependent variables and PA level the independent variables, after controlling for age, gender, school level (e.g. intermediate or high), and living areas, then significant interaction terms were also plotted on graphs as well. The significant level was set at $P < 0.05$.

**Results**

This study included 10 858 girls (51.4%) and 10 253 boys (48.6%) with a mean age of 12.2 ± 3.3 years. In total, 84.6% of the participants were from urban and 15.4% from rural areas and 90% were from public and 10% from private schools. Most students’ fathers worked in the private sector (34.9%) or were governmental employees (31.5%), and most of their mothers (88.9%) were housewives.

The mean BMI of the subjects studied was 18.5 ± 3.8 kg/m², with no gender-specific difference. The prevalences of underweight and normal weight were 13.9% (8.1% of boys and 5.7% of girls), and 72.7% (36.6% of boys and 36.2% of girls), respectively. Overweight and obesity was seen in 8.82% (4.3% of boys and 4.6% of girls), and 4.5% (2.5% of boys and 2% of girls), respectively.

The type of fat most frequently consumed in food prepared in the students’ homes was hydrogenated solid fat (73.8%). Most students (58.4%) consumed breads prepared with white wheat flour, and 19.7% of students declared that they never added salt to the food they consumed at the table. The mean frequency of consumption of deep-fried foods at home was 3.98 times per week. These eating patterns did not differ significantly between the different provinces in the study.

Overall, the consumption frequency for fruit, vegetables, dairy products and snacks (salty, fatty or sweet) was similar — almost twice a day. The PA level was significantly higher among boys than girls, in rural than in urban residents, and in the intermediate- than in the high-school students. Of the subjects studied, 34.4%, 38.9% and 25.1%, were included in the first, second and third tertiles of PA, respectively. The

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### Table 2. Logistic regression of factors studied and overweight in a national sample of Iranian children and adolescents aged 6–18 years ($n = 21,111$)

<table>
<thead>
<tr>
<th></th>
<th>BMI &lt; 85th percentile</th>
<th>BMI ≥ 85th percentile</th>
<th>Odds ratio</th>
<th>Confidence intervals (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$ (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 253 (48.6)</td>
<td>9556 (93.2%)</td>
<td>697 (6.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of consumption of fruits (fresh, dried, juice) (%)</td>
<td>46.8</td>
<td>51.5</td>
<td>0.6</td>
<td>(0.4–0.9)*</td>
</tr>
<tr>
<td>≥ 16 years</td>
<td>11.8</td>
<td>18.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Illiterate</td>
<td>13.4</td>
<td>8.1</td>
<td>0.1</td>
<td>(0.06–0.4)*</td>
</tr>
<tr>
<td>≤ 5 years</td>
<td>28.2</td>
<td>20.4</td>
<td>0.8</td>
<td>(0.4–1.4)</td>
</tr>
<tr>
<td>8 years</td>
<td>20.6</td>
<td>17.5</td>
<td>0.6</td>
<td>(0.3–1.1)</td>
</tr>
<tr>
<td>12 years</td>
<td>23.0</td>
<td>33.0</td>
<td>0.9</td>
<td>(0.5–1.5)</td>
</tr>
<tr>
<td><strong>Living area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>71.5</td>
<td>80.3</td>
<td>1.6</td>
<td>(1.02–2.5)*</td>
</tr>
<tr>
<td><strong>Energy expenditure (kcal)</strong> Mean (SD)</td>
<td>2 113.8 (1 037)</td>
<td>3 178 (1 154)</td>
<td>1.004</td>
<td>(1.003–1.004)*</td>
</tr>
<tr>
<td><strong>Time spent on physical activities of different intensities</strong> Hours/day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary (&lt; 3 METs)$d$</td>
<td>18.0 (3.1)</td>
<td>18.1 (2.8)</td>
<td>0.7</td>
<td>(0.7–0.8)*</td>
</tr>
<tr>
<td>Moderate (3–6 METs)</td>
<td>4.4 (1.5)</td>
<td>4.3 (1.4)</td>
<td>0.4</td>
<td>(0.3–0.5)*</td>
</tr>
<tr>
<td>Vigorous (&gt; 6 METs)</td>
<td>0.9 (0.1)</td>
<td>0.9 (0.03)</td>
<td>0.1</td>
<td>(0.1–0.2)*</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$ (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 858 (51.4)</td>
<td>10 141 (93.3%)</td>
<td>717 (6.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy expenditure (kcal)</strong> Mean (SD)</td>
<td>1 782.1 (784)</td>
<td>2 534 (863)</td>
<td>1.004</td>
<td>(1.004–1.005)*</td>
</tr>
<tr>
<td><strong>Time spent on physical activities of different intensities</strong> Hours/day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary (&lt; 3 METs)$d$</td>
<td>19.0 (2.9)</td>
<td>19.2 (3.0)</td>
<td>0.7</td>
<td>(0.6–0.8)*</td>
</tr>
<tr>
<td>Moderate (3–6 METs)</td>
<td>3.7 (0.4)</td>
<td>3.6 (0.3)</td>
<td>0.4</td>
<td>(0.3–0.4)*</td>
</tr>
<tr>
<td>Vigorous (&gt; 6 METs)</td>
<td>0.4 (0.03)</td>
<td>0.5 (0.08)</td>
<td>0.2</td>
<td>(0.1–0.2)*</td>
</tr>
</tbody>
</table>

*a* $P < 0.05$.

*b* $P < 0.0001$.

*sd* Standard deviation.

*MET* Standard equivalent.
mean lengths of time spent on television viewing and/or at the computer (playing games or on the Internet) among boys and girls were 4.6 and 4.1 hours per day, respectively; and both were significantly correlated \( (P < 0.0001) \) with BMI \((r = 0.61 \text{ and } 0.48, \text{ respectively})\.

As shown in Table 1, a history of breastfeeding, the frequency of consumption of dairy products and fruits, as well as high PA level showed a significant inverse association with BMI; \( R^2 \) was 0.467 among boys and 0.572 among girls. In this table, the dependent variable is BMI and the independent variables are frequency of consumption of different food groups, level of physical activity, parents’ education, parents’ occupation, school level, living area, type of milk and supplementary food consumed in infancy, birth weight, family history of obesity, family history of premature (< 55 y) cardiovascular diseases, frequency of consumption of deep-fried foods, type of fat and bread consumed.

Low frequency of consumption of fruits, living in an urban area, the time spent on PA, the energy expenditure and the fathers’ level of education remained in the logistic regression model for boys. For girls, only the time spent on PA and the energy expenditure remained in the model (Table 2). When controlling for BMI, age, gender and living area, there were significant results for PA levels and the frequency of consumption of all food groups (Table 3). As depicted in Fig. 1, for both boys and girls, the lowest and highest PA levels were associated with a higher frequency of consumption of most food groups studied.

Discussion

The present study revealed unhealthy dietary habits among Iranian children and adolescents which reflect the dietary patterns of their families. The high consumption of hydrogenated solid fat as well as deep-fried foods is common in Iranian families. Usually, the largest proportion of Iranian foods consists of bread and/or rice; as indicated in this study, the consumption of whole-grain products is low in most families. In addition, the present study showed a similar frequency of consumption of dairy products, fruit, vegetables and salty, fatty or sweet snacks that indicates a low intake of healthy foods particularly fruits and vegetables and a considerable intake of unhealthy snacks among children and adolescents.

Our findings are consistent with many recent studies among young people of different populations that have reported unhealthy dietary habits.17,18

The Middle East has the highest dietary energy surplus of the developing countries, and because of the epidemiological transition, a rapid rise in risk factors for cardiovascular disease is a potential emerging public health issue.19 Data on the young people living in the Middle East are very limited in this regard, but it is widely assumed that the picture of health and nutritional status in this region has changed during the past four decades; the traditional diet has been replaced by a more westernized diet; and elderly people are now more likely to consume healthy foods than young people.20,21

The Islamic Republic of Iran has undergone a rapid nutrition transition. This is suggested to be secondary to the rapid change noted in fertility and mortality patterns and to urbanization. This transition has led to a considerable imbalance in food consumption with low nutrient density characterizing the diet and over-consumption evident among more than a third of households.22 The few studies performed of dietary habits among Iranians have shown similar patterns in the general population.23 Even a national study in very young children revealed that the weekly frequency of consumption of junk food was higher than that of major food items.24

During the past few decades, in developed countries, PA levels among both adults and children have declined steadily.25,26 Data from three national surveys among Iranian adults have shown that more than 80% of the Iranian population are physically inactive.27 The few local studies performed in Iranian young people have revealed a similar pattern.28,29 The decrease in PA levels is suggested to be a result of an increase in time spent watching television and playing computer games, as well as a decrease in opportunities for PA in schools and communities.

A complex interaction between genetic, environmental and behavioural factors is known to be the underlying cause of childhood obesity.29 However, findings on the role of dietary pattern and PA rates in this global health problem are inconclusive.30 In our study, a history of breastfeeding, higher intake of dairy products, fruit and vegetables as well as high PA level had a significant inverse association with BMI. Among boys, low consumption of fruits, living in an urban area, time spent on PA, energy expenditure and the fathers’ education were significantly associated with overweight, and among girls, only the time spent on PA and the energy expenditure are significantly correlated with BMI; \((P < 0.0001)\).
expenditure were significantly associated with overweight. These findings are consistent with those of some previous studies.31–33

Of particular interest in the context of our study are the inverse associations between overweight and fruit consumption. This finding is consistent with the results of Bernard et al.34 Barba et al. were the first to report a significant inverse association between frequency of milk consumption and BMI in children.35 In our study, such findings were significant for boys, but not for girls. Although we did not find any significant association between the frequencies of consumption of fried foods, the type of oil and bread consumed, and the BMI, such dietary habits are considered to have long-term adverse effects on health that could not be shown in this cross-sectional study. The current study showed that the time spent on sedentary activities, e.g. watching television and playing computer games, was more than twice that recommended for this age group.36 This time was inversely related to the BMI. Although a recent study did not find such an association,37 many previous studies have confirmed the impact of television viewing on childhood obesity.38 This habit can have both short- and long-term effects on health,39 and greater efforts to reduce sedentary activities from an early age are critical national priorities.

We found significant interactions between the levels of PA and dietary habits. The higher frequency of consumption of fruits and vegetables among
Relation entre l’indice de masse corporelle et l’association activité physique/comportements alimentaires dans un échantillon national d’enfants et d’adolescents iraniens : Étude CASPIAN

Objectif Étudier la relation entre les pratiques en matière d’alimentation et d’activité physique et l’indice de masse corporelle (IMC), ainsi que les associations de ces pratiques parmi les enfants.

Méthodes Un échantillon représentatif randomisé, composé de 21 111 élèves âgés de 6 à 18 ans, a été sélectionné par une procédure de sondage en grappe à plusieurs degrés dans 23 provinces de la République Islamique d’Iran. Les pratiques en matière d’activité physique et d’alimentation ont été évaluées par des questionnaires validés auto-administrés.

Résultats Les fréquences de consommation de fruits et légumes, de produits laitiers et d’en-cas (salés, gras ou sucrés) étaient similaires et de deux fois par jour environ. Les matières grasses les plus fréquemment consommées étaient des matières grasses solides hydrogénées (consommées par 73,8 % des familles). Le niveau d’activité physique était nettement plus élevé chez les garçons que chez les filles, chez les ruraux que chez les urbains et chez les étudiants de cycle intermédiaire que chez les étudiants de l’enseignement supérieur. Chez les garçons, la fréquence de consommation de légumes et de protéines végétales ($R^2 = 0,46$); et chez les filles, la fréquence de consommation de produits laitiers et de fruits, ainsi que la pratique d’une activité physique intensive, présentaient une corrélation inverse significative avec l’indice de masse corporelle. Les fréquences de consommation de fruits et légumes, ainsi que la pratique d’une activité physique intensive, présentaient une corrélation inverse significative avec l’indice de masse corporelle.

Conclusion Les résultats des questionnaires validés auto-administrés. Les fréquences de consommation de fruits et légumes, ainsi que la pratique d’une activité physique intensive, présentaient une corrélation inverse significative avec l’indice de masse corporelle.

Study limitations We acknowledge that certain factors might have influenced the findings of the present study, such as the assumptions made regarding the few missing data and the potential recall bias in the process of recalling and recording food intake and PA. In view of the large number of subjects studied, only a quantitative food frequency questionnaire was used in the present survey, and such data can not provide figures for the precise nutrient and energy intake of the subjects studied. The findings of the analysis of factors associated with BMI and overweight should be interpreted with caution given the cross-sectional nature of the associations.

Acknowledgements The project was funded by grant TSA03/11 WHO/EMR and by the Iranian Ministry of Health and the Ministry for Education. The authors would like to offer their sincere thanks to all members of the large team working in this project, as well as to the children and parents who participated in this study. We are grateful to Dr Beth Carlton Tohill for her incisive comments on this paper.

Competing interests: none declared.
Asociación de la actividad física y los hábitos alimentarios en relación con el índice de masa corporal en una muestra nacional de niños y adolescentes iraníes: estudio CASPIAN

Objetivo Examinar la relación entre los hábitos alimentarios y el grado de actividad física (AF) por un lado y el índice de masa corporal por el otro, así como las asociaciones entre esas variables en la población infantil.

Métodos Se seleccionó una muestra representativa de 21 111 escolares de 6-18 años mediante técnicas de muestreo aleatorio multietápico por conglomerados en 23 provincias de la República Islámica del Irán. La AF y los hábitos alimentarios se evaluaron mediante cuestionarios validados autoadministrados.

Resultados La frecuencia de consumo de frutas y verduras, productos lácteos y refrescos (salados, grasos o dulces) fue similar, de aproximadamente dos veces al día. El tipo de grasa consumido con más frecuencia eran las grasas sólidas hidrogenadas (73,8% de las familias). El nivel de AF fue significativamente mayor entre los varones que entre las muchachas, en los residentes en zonas rurales que en las de zonas urbanas, y en los alumnos de nivel medio que en los alumnos de instituto. Entre los chicos, la frecuencia de consumo de verduras y proteínas vegetales ($R^2 = 0.46$), y entre las chicas la frecuencia de consumo de productos lácteos y fruta, así como un nivel alto de AF, estaban inversamente relacionados, de forma significativa, con el IMC ($R^2 = 0.57$). Entre los chicos, la baja frecuencia de consumo de fruta, el tiempo invertido en alguna actividad física (AF) y el gasto energético estaban relacionados sensiblemente con el exceso de peso. Al controlar las covariables, se observó que los niveles de AF estaban relacionados de forma significativa con la frecuencia de consumo de todos los grupos de alimentos.

Conclusión Los modos de vida poco saludables predisponen a los jóvenes iraníes a sufrir enfermedades crónicas más adelante en la vida. La relación entre los hábitos alimentarios y el nivel de AF es un aspecto a considerar a la hora de estudiar los beneficios para la salud asociados a esos factores.
References


