



Research report

Dietary factors as the major determinants of overweight and obesity among Iranian adolescents. A cross-sectional study [☆]



Monireh Hatami ^{a,*}, Mohd Nasir Mohd Taib ^b, Rosita Jamaluddin ^b, Hazizi Abu Saad ^b,
Abolghasem Djazayeri ^c, Maryam Chamari ^d, Mojgan Nazari ^e

^a Division of Prevention Development, Behzisti Organization, Ministry of Welfare and Social Security, 1931974194 Tehran, Iran

^b Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

^c Department of Nutrition and Biochemistry, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

^d Department of Nutrition and Biochemistry, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

^e Research Center for Child & Maternity Care, Hamadan University of Medical Sciences, Hamadan, Iran

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ABSTRACT

This study investigated the determinants of overweight/obesity in adolescents. A cross-sectional survey was carried out on 1157 adolescents. Weight and height were measured. Information on socio-economic status (SES), dietary intakes, physical activity, and sedentary behaviours were collected by a self-administered questionnaire. Binary and multivariate binary logistic regressions were used to obtain the relationships and odds-ratios, respectively. The prevalence of overweight and obesity was higher among adolescents in low- or high-income families, adolescents whose mothers worked out of home, adolescents whose parents were both overweight, adolescents who watched a lot of TV or had excessive energy intake, adolescents with lower physical activity or lower intake of dietary fibre, those who skipped breakfast ≥ 4 times per week, and those with low and high fat intake. However, multiple logistic regression analysis showed that only energy intake was associated with increased odds and vegetables and fibre intake were associated with a reduction in the odds of being overweight (all $p < 0.05$). Adolescents from middle SES showed a lower risk of overweight/obesity than low and high SES due to better dietary intakes and less sedentary behaviours. Therefore, in overweight/obesity prevention programs, adolescents with determined risk factors from families with low and high SES should receive attention.

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Introduction

Overweight and obesity are the emerging threats to the health status of adolescents living in developed countries as well as in Asia and Asia Pacific regions (WHO, 2002). Over the last 20 years, the prevalence of obesity and overweight has increased at an alarming rate not only in developed countries, but also around the world. According to the new data from some countries where surveys have been done, one in three adolescents is obese and overweight and obesity are now dramatically increasing in low- and middle-income countries (WHO, 2014).

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* Corresponding author.

E-mail address: monirehhatami@gmail.com (M. Hatami).

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The prevalence of overweight and obesity in the Middle East, Australasia, Pacific Islands, and China has increased threefolds or more since 1980 (Misra & Khurana, 2008). Although the reported prevalence of obesity among Iranian adolescents is less than that of developed countries like the USA, studies have shown a relatively high prevalence of obesity among Iranian adolescents in different cities. For example, Maddah (2007) and Rashidi et al. (2007) reported that the prevalence of overweight and obesity in adolescents was 21.9%, 5.3% and 23.1%, 8.3%, respectively. In fact, in recent years, obesity has been the number one nutritional problem in Iran (Malekzadeh, Mohamadnejad, Merat, Pourshams, & Etemadi, 2005).

Overweight and obesity in children and adolescents are associated with chronic diseases and premature deaths in adulthood. In a literature review, Reilly et al. (2003) highlighted that cardiovascular diseases and psychological morbidity were the main side effects of childhood obesity. In Iran, Hamidi et al. (2006) found that 81.9% of obese children and 75.4% of overweight children had at least one cardiovascular risk factor. They showed significant correlations between body mass index and systolic blood pressure, diastolic blood pressure, serum triglyceride, and Apo-lipoprotein B levels (P -values < 0.01). Also, a national study among children and adolescents

aged 6–18 years revealed that 2–14% of Iranian children and adolescents (about 320,000–2,240,000) suffered from metabolic syndrome (Misra & Khurana, 2008). The study indicated that Iran would face a chronic disease epidemic in the near future.

There is limited information about the determinants of overweight/obesity in adolescents in Iran. The WHO MONICA project (monitoring of cardiovascular diseases) in Iran in 1998 revealed that Iran was one of the seven countries with the greatest proportion of obesity (Kelishadi et al., 2003). A review conducted by Mirmiran, Sherafat-Kazemzadeh, Jalali-Farahani, and Azizi (2010) compared the problem of childhood obesity in different age groups of children and adolescents among the Middle-East countries. This review showed a steady rise in prevalence of overweight/obesity in older individuals, males, and those with a higher socioeconomic status.

Although the burden of obesity tends to shift towards groups with lower socioeconomic status in populations of developing countries, findings about the relationship between the socioeconomic status (SES) and obesity are inconsistent. Several studies in developing countries have shown a positive relationship between SES and the prevalence of obesity among young individuals ($p < 0.05$) (Laxmaiah, Nagalla, Vijayaraghavan, & Nair, 2007; Shi, Lien, Kumar, Dalen, & Holmboe-Ottesen, 2005). By contrast, some researchers in Iran have shown an inverse association between the SES and the obesity prevalence (Maddah & Nikooyeh, 2010; Mozaffari & Nabaei, 2007). Nevertheless, WHO (2006) considered socioeconomic determinants of health among adolescents important enough to be addressed in planning appropriate intervention programs to improve adolescent health. So, in the present study, we identified the determinants of overweight/obesity based on socioeconomic factors among adolescents aged 10–18 years.

Methods

Sample

The study was conducted from mid November 2009 through April 2010. A total of 1157 male and female adolescents aged 10–18 years in primary, secondary, and high schools of Tehran, the capital city of Iran, participated in this study. To obtain an enough sample size, the highest available prevalence of overweight/obesity (28.9%) (BMI \geq 85th percentile) reported in a study conducted by Mohammadpour-Ahranjani, Rashidi, Karandish, Eshraghian, and Kalantari (2004) among adolescents was applied in the following sample size formula (Lemeshow, Hosmer, Klar, & Lwanga, 1990):

$$n = \frac{z_{1-\alpha/2}^2 \sum_{h=1}^l N_h^2 P_h (1 - P_h) / w_h}{N^2 d^2}$$

Where:

n = sample size

N = population of individuals in all strata (899,000 students)

$z_{1-\alpha/2}$ = Z statistic for a level of confidence of 95% (1.96)

d = determining precision (0.03)

N_h = population of individuals in stratum h

l = numbers of strata (in this study is 5)

P_h = the prevalence of overweight and obesity in stratum h (0.29)

w_h = the proportion of population in stratum h to N

Sampling procedure followed a multistage stratified sampling design with regards to the distribution of students in educational districts in Tehran. To obtain a representative sample, based on the information obtained from the Iranian Ministry of Education, the educational districts were divided into five geographical zones (central, north, south, west, and east). One district was then chosen randomly from each geographical zone (stratum) through a random number generator. In each selected educational district, two schools

were then randomly selected (one for girls and one for boys) in each educational level. Hence, six schools in each district were selected: girls' primary school, boys' primary school, girls' middle school, boys' middle school, girls' high school, and boys' high school (a total of 30 schools). All selected schools (15 girls' school and 15 boys' school) agreed to participate in the study. Based on a stratified sampling formula, the sample size was calculated for each district. Therefore, it was possible to calculate the number of samples in each school.

Within each selected school, participants were then systematically chosen using the available list of students' names from the school principal's office called systematic sampling with a random start. The sampling interval was calculated by dividing the population size by the sample size for each school separately. Absent students on the sampling day, physically disabled, and non-Iranian students were excluded from the study before sampling. A total of 73 students refused to participate in the study or did not complete the questionnaire making the final sample 1157 students. The response rate was 94.1%.

Procedure and materials

Ethical approval to carry out the study was obtained from the Medical Research Ethics Committee, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia (UPM) and from the Iranian Ministry of Education. Subsequently, an information letter about this study together with the letter of permission from the related deputy of districts were taken to the selected school. Once the approval was granted from the principal of the school, the participants were selected. Information sheets and letters were then sent to parents requesting their consent for their children's participation in the study.

Data obtained from self-administered questionnaires

A self-administered questionnaire, which consisted of personal information about age, sex, educational level, physical activity, duration of watching television and using the computer on weekdays and weekends, and frequency of intake of selected foods (fruits, natural fruit juice, vegetables (green, yellow, raw and cooked vegetables), candy/chocolate, soft drink, sweetened drink, milk, chips, and fried potatoes) per week, was completed by the participants. A valid and reliable Physical Activity Questionnaires for Children (PAQ-C) and Adolescents (PAQ-A) were used to assess the physical activity level of the participants (Kowalski, Crocker, & Donen, 2004; Kowalski, Crocker, & Kowalski, 1997). Each question received a score and then, the sum of the scores was calculated. The final physical activity score was obtained by taking the mean of questions' scores. The total scores were divided into tertiles to classify the respondents into three categories: low PA, moderate PA, and high PA. The Youth Risk Behavior Survey (CDC, 2007) was used to ask about watching TV on weekdays and weekends, and the frequency of eating selected foods mentioned above in the last week. We also asked how many times they consumed fast food and breakfast during the previous week. Watching TV and working with computer were calculated as hours per weekdays and weekends. The participants were categorized into three groups for each variable according to calculated tertiles in the current study. Energy and macronutrients data was obtained by using the method of 24-hour recall. The respondents were asked to recall all foods, beverages, and supplements during the previous 24-hour period or the preceding day.

In the first step, the questionnaire was translated into Persian and then was back-translated into English. The back translated and the original questionnaires were then compared to verify that the original meaning of each item was retained in the questionnaire. In the next step, content validity of the Persian language version was established through calculating the Content Validity Index (CVI) using a panel of five experts in the disciplines of nutrition and the research team which showed a good content validity (Yaghmale, 2003). Finally, a pre-test was

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