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Breakfast eating pattern and its association with dietary quality indices and anthropometric measurements in young women in Isfahan

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ABSTRACT

Objective: To assess the association between consuming or skipping breakfast and dietary quality indices such as the Healthy Eating Index (HEI), the Dietary Diversity Score (DDS), diversity scores of different food groups, and anthropometric measurements in young Isfahanian women.
Methods: Women 18 to 28 y old were selected randomly from among university students ($n = 411$) in Isfahan, Iran. A validated semiquantitative questionnaire was used to assess dietary intake. Five food groups of the Food Guide Pyramid were considered for calculating the DDS and diversity score of the food groups. Subjects were categorized based on consuming or skipping breakfast. The HEI was calculated based on 10 components including the five food groups, different fat and sodium intakes, and the DDS.
Results: Breakfast consumers versus skippers had higher scores for the HEI (66 ± 13 versus 47 ± 13, $P = 0.001$), the DDS (6.8 ± 1.2 versus 4.9 ± 0.7, $P = 0.001$), and the DDSs for fruits (1.3 ± 0.2 versus 0.9 ± 0.1, $P = 0.001$), vegetables (1.6 ± 0.2 versus 1.2 ± 0.1, $P = 0.001$), and whole grains (1.3 ± 0.2 versus 0.9 ± 0.1, $P = 0.001$). Also, eating breakfast was associated with lower values for dietary energy density (0.96 ± 0.25 versus 1.04 ± 0.40, $P = 0.01$), the body mass index (20.0 ± 1.8 versus 23.3 ± 2.7, $P = 0.001$), and waist circumference (69.2 ± 7.6 versus 72.5 ± 8.7, $P = 0.001$). There was a higher prevalence of breakfast consumers in the third tertiles of the HEI and DDS. However, there was a smaller percentage of breakfast consumers in the third tertiles of the body mass index and waist circumference.
Conclusions: Breakfast consumption was associated with higher scores of the dietary quality indices and lower values for the body mass index and waist circumference in young Isfahanian women. Further studies should be performed to determine the relation between the kind of breakfast consumed and the dietary quality indices.

Introduction

Different cross-sectional and longitudinal studies have shown the association between breakfast consumption and the risk of chronic diseases such as obesity in children, adolescents, and adults [1–4]. Longitudinal breakfast skipping has detrimental effects on cardiometabolic risks such as waist circumference (WC), fasting blood sugar, low-density lipoprotein, and total cholesterol [5]. Also, in a randomized cross-over clinical trial, breakfast skipping led to an impaired fasting lipid profile and postprandial insulin sensitivity [6]. There are some explanations for this association, such as appetite control and blood sugar control, in those consuming breakfast regularly [7]. Skipping breakfast has been correlated with a poor diet quality and higher intakes of energy and high-fat foods in remaining hours of the day [7,8]. Skipping breakfast has been found to lead to the consumption of energy-dense foods in the other meals [8]. Omitting breakfast has been found to affect children's appetite rating at subsequent meals based on the results from a clinical trial study in 21 8- to 10-y-old children [9]. Furthermore, omitting breakfast in adults has been related to health-compromising behaviors [10].

It has been shown that higher diet quality indices such as the Healthy Eating Index (HEI) [11] and the Dietary Diversity Score (DDS), especially higher scores of vegetables, fruits, and whole

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grains, are inversely associated with general and central obesity [12]. Hence, the positive association between skipping breakfast and body weight might be mediated by lower diet quality indices.

The useful application of the HEI [13–16], DDS, and even the diversity score of different food groups for assessing diet quality worldwide and in the Iranian population has been proved previously [17–20]. To date, few studies have been undertaken to compare the consumption of dietary food groups between breakfast consumers and skippers [21] and no study, to our knowledge, has examined the diversity scores of different groups in young adults. Most previous studies have focused on adolescents and children [20,22–24], although young adults have a high risk of skipping breakfast [25] and relying on fast foods [26], which leads to an energy-dense and a nutrient- poor diet [27]. Furthermore, the frequency of breakfast consumption has been decreasing by age up to young adulthood [28]. Hence, it is necessary to prevent and correct unhealthy eating habits in young adults.

Although the association between breakfast consumption and diet quality [22,29] and between breakfast consumption and anthropometric measurements [4,30,31] has been assessed widely, but owing to different dietary patterns among various populations and the American basis of some diet quality indices such as the HEI [14,32], it is better to study one particular country. However, we are not aware of any study in this regard in young Iranian adults and the relations among breakfast consumption, the DDS, and even scores of food groups as indices of diet quality. Therefore, in the present study, we examined the association between breakfast consumption and anthropometric measurements and dietary quality indices such as the HEI, DDS, and scores of different food groups and dietary energy density in young Iranian women.

Materials and methods

Subjects

The sample of the present study was recruited based on a representative sample of 18- to 28-y-old women studying in the Isfahan University of Medical Sciences in Iran. They were selected by a multistage cluster random sampling method. First, we considered all the schools of the Isfahan University of Medical Sciences; second, some departments were randomly chosen and some students were chosen randomly from each department. Therefore, students in all sociodemographic statuses were included in this population.

Data from 411 students were entered for statistical analysis in the present study regarding the relation between breakfast consumption and diet quality indices. Breakfast consumers consumed any food or beverage, excluding water, before 10:00 h for more than 5 d/wk and breakfast skippers did not consume any food or beverage before 10:00 h or consumed breakfast for fewer than 5 d/wk. Written informed consent was obtained from each participant. The study was approved by the research council and ethical committee of the School of Health, Isfahan University of Medical Sciences.

Assessment of dietary intake

For evaluating the dietary intake, a 168-item semiquantitative food-frequency questionnaire (FFQ) was used. The FFQ consisted of a list of foods with standard serving sizes. Participants were asked to report their frequency and amount of each food item consumed during the previous year on a daily (e.g., bread), weekly (e.g., rice, meat), or monthly (e.g., fish) basis. Portion sizes of the consumed foods were converted to grams using household measurements [33]. Nutritionist III 7.0 (N-Squared Computing, Salem, OR) was used for the nutrient analysis of the diets. The database of this software was modified for Iranian foods. Then, all items were converted to daily intakes. The validity and reliability of the FFQ have been reported previously [34]. The total energy intake was calculated by summing the energy intakes of all foods.

Assessment of anthropometric measurements

Weight was measured in minimally clothed subjects on digital scales. Height was measured using a tape measure while the subjects were standing in a normal position. The body mass index (BMI) was calculated as weight (kilograms) divided by height (meters) squared. WC was measured at the narrowest level and hip circumference at the maximum level over light clothing using an unstretched tape without any pressure to the body surface; measurements were recorded to the nearest 0.1 cm [35]. All measurements were performed by trained dietitians.

Assessment of other variables

Sociodemographic and physical status information was obtained with questionnaires. Sociodemographic questionnaires contained some questions on family income, parents' education level and occupation, house ownership, traveling abroad in the previous year, and the number of sisters and brothers. Based on the different responses, we categorized the total score to three categories: low (scores <33%), middle (scores 33%–66%), and high (scores >66%). A metabolic equivalent task per hour per week was considered the unit for expression of physical activity level [36].

Definition of terms

Obesity was defined as a BMI of at least 30 kg/m^2 [37] and overweight was considered a BMI of 25 to lower than 30 kg/m^2 [37]. A WC larger than 88 cm was considered as abdominal obesity [38].

Dietary Diversity Score

The DDS was calculated according to the method of Kant et al. [39,40]. Five food groups based on the food groups introduced by USDA's Food Guide Pyramid (bread–grains, vegetables, fruits, meats, and dairy) were considered [41]. The main groups were divided into 23 subgroups. These subgroups showed the dietary diversity across the groups of the Food Guide Pyramid [41]. Seven subgroups were considered for the bread–grain group (refined bread, biscuits, macaroni, whole bread, corn flakes, rice, and refined flour). We divided fruits into two subgroups (fruit and fruit juice, berries and citrus). The vegetable group was divided into seven subgroups (vegetables, potatoes, tomatoes, other starchy vegetables, legumes, yellow vegetables, and green vegetables). Four subgroups were considered for meat (red meat, poultry, fish, and eggs), and for the dairy we considered three subgroups (milk, yogurt, and cheese). Consuming at least a one-half serving on 1 d according to the Food Pyramid quantity criteria was defined as the consumption of a group. Each of the five broad food categories received a maximum diversity score of 2 of the 10 possible score points. The total score was the sum of the scores of the five main groups. The maximum and minimum scores of total dietary diversity were 0 to 10. The same method was used to calculate each food-group diversity score. Thus, the maximum and minimum scores of food group diversity were 0 to 2 within each food group. Consuming at least one-half serving of any subgroup on 1 d according to the Food Pyramid quantity criteria was considered consumption of the subgroup. For example, for the bread–grain group, if a subject consumed whole grains, macaroni, and biscuits, her score was calculated as $(3 \div 7) \times 2 = 0.85$. Therefore, the diversity score of the bread–grain group was 0.85.

Dietary energy density

To calculate this variable, each subject's reported daily energy intake (kilocalories per day) was divided into the total weight of foods (excluding beverages) consumed (grams per day) [42]. The total weight of foods consumed by the subjects was calculated by summing the weight of foods only (154 of 168 food items in the FFQ). We did not consider the weight of drinks consumed because, based on some findings, the effect of dietary energy density on body weight is related to the changes in the weight of food intake, not drinks [43]. Considering beverage in the calculation of energy density is still under debate; however, we did not consider beverages in the energy density calculation.

Healthy Eating Index

The HEI was calculated according to method of Kennedy et al. [44]. In this method, the HEI contains 10 different components. The first five components are the amounts of the five groups of grains, vegetables, fruits, milk, and meat expressed as servings per day. Intakes at or above the recommended amounts were awarded a food score of 10 points [45]. Those who consumed no servings of a food group received a score of 0. Scores from 0 to 10 were calculated proportionately. Components 6 and 7 indicated the scores of the percentages of consumed total fat and saturated fatty acids, respectively. Components 8 and 9 indicated the scores of cholesterol intake and dietary variety. A full score of 10 points was awarded for diets with energy from fat lower than 30%, energy from saturated fat lower than 10%, and cholesterol lower than 300 mg. Component 10 was related to sodium. A full score of 10 was awarded to those not adding table salt according to the FFQ.