Applied nutritional investigation

Meal frequency in relation to prevalence of functional dyspepsia among Iranian adults

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A B S T R A C T

Objective: Limited data are available linking diet-related practices to functional dyspepsia (FD). The aim of this study was to investigate the association between meal frequency and prevalence of FD among a large sample of Iranian adults.
Methods: In this cross-sectional study, 4763 individuals from the general adult population in Isfahan were asked to report on how many main meals and snacks they consumed each day. Frequency of total meals was defined by summing up the frequency of main meals and snacks. Participants were grouped into four categories: less than three, three to five, six to seven, and eight or more meals daily. FD symptoms were assessed using a validated Persian version of the Rome III questionnaire, and FD was defined as bothersome postprandial fullness, early satiation, and/or epigastric pain or epigastric burning.
Results: Compared with individuals who had one main meal per day, those who consumed three main meals daily had a lower chance for early satiation (odds ratio [OR], 0.44; 95% confidence interval [CI], 0.21–0.90). Findings from the analysis on snack frequency revealed that, compared with those who never consumed snacks, individuals who consumed three to five snacks daily were 39% less likely to have FD (OR, 0.61; 95% CI, 0.40–0.92), had 42% lower odds of postprandial fullness (OR, 0.58; 95% CI, 0.34–0.98), and were at 43% lower risk for epigastric pain (OR, 0.57; 95% CI, 0.34–0.97). After adjustment for potential confounders, including diet-related behaviors, individuals who consumed six to seven total meals and snacks per day had lower odds of FD (OR, 0.51; 95% CI, 0.31–0.82) compared with those with who ate fewer than three meals and snacks daily. A similar inverse association was seen between meal and snack frequency and early satiation (OR, 0.32; 95% CI, 0.16–0.63) and postprandial fullness (OR, 0.54; 95% CI, 0.29–0.98).
Conclusion: Results from the present study demonstrated an inverse association between meal and snack frequency and prevalence of FD and its components. Prospective studies are required to confirm these findings.

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Introduction

Dyspepsia is characterized by upper gastrointestinal (GI) symptoms, which include epigastric pain and discomfort, fullness, bloating, nausea, belching, and vomiting. These symptoms are generally related to food ingestion. The estimation of the prevalence of functional dyspepsia (FD) has been reported at ~20% to 30% worldwide [1]. In the United States, the prevalence of dyspepsia has been reported to be 44% among adults [2]. In Iran, it has been estimated that 2.2% to 29.9% of the adult population are affected [3,4]. The wide range of estimation is due to the different definitions used and different age groups studied. Functional dyspepsia is not life-threatening; however, the effect of this condition on patients and health care services is considerable. The total direct (for hospitalization and physician visits) and indirect costs of disease per patient with dyspepsia in Iran were estimated at 108.10 and 12.1 purchasing power parity dollars, respectively [3].

The exact etiology of FD remains to be identified. Patients generally relate their dyspeptic symptoms to food ingestion; however, few studies have investigated this relation, and there have been contradictory findings [5]. Some studies have found no significant differences in dietary intakes of FD patients compared with controls [6]. On the other hand, others have reported lower intakes of energy, fat, carbohydrates, proteins, and vitamin C among women with FD compared with controls [7].

Aside from dietary intakes, eating behaviors seem to be an important contributor to FD. One of the most important dietary behaviors that might contribute to FD is frequency of eating. Few data are available linking meal or snack frequency to FD. Frequency of eating snacks has been reported as higher among patients with FD than in controls. Furthermore, patients with FD have been reported to eat small portion sizes compared with healthy adults [7]. Some studies have suggested a significant difference in meal frequency between patients with FD and controls; however, differences between "meals" and "snacks" were not clarified in that study [7]. In a study from Brazil, there was a trend toward lower frequency of meals per day among patients with FD [8]. In another observation, no significant differences were noted in the frequency of eating between patients with FD and healthy adults [6]. Meal frequency might affect dyspepsia by influencing GI secretions, which can in turn affect satiety and fullness. To our knowledge, there are no epidemiologic studies assessing the relationship between meal frequency and dyspepsia.

We hypothesized the following:

1. Lower meal and snack frequency might be related to a greater chance of FD and its symptoms;
2. The number of meals and snacks might be inversely related to the frequency of FD symptoms.

The aim of this study was to investigate the relationship between eating frequency and prevalence of FD, as well as its symptoms, among a large group of Iranian adults.

Methods and materials

Study population

The present cross-sectional study was performed in the framework of the SEPAHAN (the Study on the Epidemiology of Psychological, Alimentary Health and Nutrition) trial conducted among the general adult population of Isfahan working in 50 different health centers affiliated with Isfahan University of Medical Sciences, Isfahan, Iran [9]. The project was done in two phases. During phase 1, a detailed self-administered questionnaire on sociodemographic factors and dietary behaviors was distributed among 10 087 individuals, and 8691 (response rate: 86.16%) individuals returned the completed questionnaire. In phase 2, relevant information of GI health was gathered. In the present study, data on 4763 individuals who had complete information on relevant variables were analyzed. The Regional Bioethics Committee of Isfahan University of Medical Sciences approved the study protocol, and participants had provided informed written consent.

Assessment of meal frequency

To investigate meal frequency, we asked the participants to answer the following questions: "How many main meals do you consume each day?" and "How many snacks do you consume each day?" They could respond to the first question by choosing one of these choices: one, two, or three. The second question could be responded to by choosing one of these choices: none, one to two, three to five, more than five. Frequency of total meals was defined by summing the frequency of main meals and snacks. Participants were categorized in terms of total meals into four categories: less than three, three to five, six to seven, and eight or more meals.

Assessment of functional dyspepsia

A modified Persian version of the Rome III questionnaire, as part of the main comprehensive questionnaire was used for assessment of FD. During the face validation of the questionnaire, we found that most participants were unable to distinguish between the descriptors used in the original Rome III questionnaire (never, <1 d/mo, 1 d/mo, 2–3 d/mo, 1 d/wk, >1 d/wk, daily). Therefore, the rating scale was modified to consist of only four descriptors (i.e., never or rarely, sometimes, often, always) [9]. In the present study, individuals with one or more of the following characteristics were defined as having FD: bothersome postprandial fullness (defined as feeling uncomfortably full after a regular-sized meal, often or always), early satiation (defined as being unable to finish a regular-sized meal, often or always), and/or epigastric pain or epigastric burning (defined as feeling pain or burning in the middle of abdomen, often or always). The validity and reliability of the Persian version of the Rome III questionnaire in an Iranian population has been demonstrated previously [10]. Additionally, we inquired about the severity of each FD symptom using a four-item rating scale (mild, moderate, severe, and very severe).

Assessment of other variables

Data on body weight and height were obtained through the use of a self-reported questionnaire. Body mass index (BMI) was calculated as weight (in kg) divided by height (in m^2). Overweight/obesity was defined as BMI ≥ 25 kg/m^2. The General Practice Physical Activity Questionnaire (GPPAQ) was used to assess physical activity levels of study participants. The GPPAQ is a simple validated screening tool for ranking adults' physical activity with a focus on current general activities [11]. Participants were asked to report their activities based on questions in the GPPAQ. We classified participants into two categories of physical activity: "active and moderately active" (defined as ≥ 1 h/wk of activity) and "moderately inactive and inactive" (defined as <1 h/wk of activity). Additional information about age, sex, smoking habits, and presence of diabetes were obtained through the use of a questionnaire.

Participants were asked to fill out a questionnaire about their meal patterns: how regularly they consumed their meal (never, occasionally, often, and always), how regularly they consumed their breakfast (never or 1 d/wk, 2–4 d/wk, 5–6 d/wk, daily), how much time they spend eating lunch (never eat lunch, >20 min, 10–20 min, <10 min), how much time they spend eating dinner (never eat dinner, >20 min, 10–20 min, <10 min). Quality of chewing was evaluated by the following question: How thoroughly do you chew food? Answers were not very well, well, very well. Intrameal fluid intake was investigated through questions about drinking fluids with meals or immediately before and after meals (never, sometimes, often, and always). Meal-to-sleep interval was evaluated by the following questions: How long does it take to go to bed (or to lie down) after lunch (never sleep or lie down, <30 min, 0.5–<2 h, 2–4 h, >4 h), after dinner (<30 min, 0.5–<2 h, 2–4 h, >4 h) or after snack consumption (never eat snack, <30 min, 0.5–2 h, >2 h). With regard to fried and spicy food intake, participants were asked to report how many days per week these types of food were consumed.

Statistical analysis

Comparison of continuous variables across different categories of meal or snack frequency was assessed using one-way analysis of variance. The χ^2 test was used to examine the distribution of participants in term of categorical variables across different categories of meal or snack frequency. The relationship between meal or snack frequency and FD or its components was examined using logistic regression in different models. First, the relationship was assessed in crude model. Then, age (continuous), sex (male, female), physical activity (≥ 1 h/wk, <1 h/wk), smoking (current smokers, ex-smokers, nonsmokers), and self-reported diabetes (yes, no) were adjusted for in the first model. Further adjustment for meal regularity (non-regular, regular), eating rate (slow, quick, or <10 min), breakfast consumption (ordinal), intrameal fluid intake (never or