Anxiety as a consequence of modern dietary pattern in adults in Tehran—Iran

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ARTICLE INFO

Article history:
Received 24 July 2012
Received in revised form 12 December 2012
Accepted 21 December 2012
Available online 9 January 2013

Keywords:
Adults
Anxiety
Dietary pattern
Processed food consumption
Iran

ABSTRACT

Food intake patterns in relation to mental health have already been revealed. To investigate the relationship between processed food consumption behavior and anxiety disorder, a cross sectional study was conducted. Overall, 1782 young adults aged 18–35 years were randomly selected using cluster sampling method from 22 districts of Tehran—Iran in 2011. Diet assessment was done using a 24 hour recall questionnaire in two times with a week interval. Anxiety level was determined using the validated Spelberger test (Persian version). A proportional odds regression model was used to assess the effect of processed food consumption on anxiety variables. A significant statistical difference was found between men and women in terms of processed food consumption (p<0.001). Adjusting for age, total calorie intake, gender, body mass index, socioeconomic status, and history of sedative drug consumption as well as mental health disorders, the proportional odds regression model showed a significant relationship between increased consumption of processed foods and anxiety (OR = 4.73, 95% CI: 2.89–12.54 for state and OR= 4.91, 95% CI: 2.88–13.99 for trait). Identification, modification and adjusting incorrect food patterns in the community could be considered as valuable steps to turn down nutritional-based health difficulties.

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1. Introduction

As an important aspect of lifestyle, food habits can affect health, morbidity and mortality indexes. Food intake patterns and in association with mental health have already been reported (Christensen & Pettijohn, 2001). Serving of fast foods was debated since the early 1940s in Southern California and nowadays high proportions of restaur-

ants are preparing and serving these kinds of foods (Schlosser et al., 2004). Consumption of fast foods might be influenced by parental full time jobs that have no enough time for regular cooking. Fast-food advertisements and cheaper prices are also important (St-Onge, Keller, & Heymsfield, 2003). It is assumed that consumption of processed foods is accompanied by getting more energy (calories) leading to overweight and obesity (Schröder, Fito, & Covas, 2007). Processed foods have found their path into nearly all parts of local communities, public schools and hospitals (Cram, Nallamothu, Fendrick, & Saint, 2002; Levine, 1999). Likewise, consumption of such foods results in taking more saturated fatty acids and lower nutrients (Harnack & French, 2003; Paeratakul, Ferdinand, Champagne, Ryan, & Bray, 2003).

The patterns of non-communucatable disease (NCD) including obesity, cardiovascular diseases and type 2 diabetes have sensibly been distorted in recent years, probably as the main adverse outcome of changes in food habits and physical activity level (PAL), (WHO & Consultation, 2003). The impact of diet on psychological state and depression (Jacka et al., 2010), inflammation (Liu et al., 2002), brain function (Gómez-Pinilla, 2008; Molteni, Barnard, Ying, Roberts, & Gomez-Pinilla, 2002), and stress response system (Tannenbaum et al., 1997) in addition to oxidative process (Engelhart et al., 2002) has altered the pattern of NCDs either directly or indirectly.

Overeating is a common habit of majority of people who try to cope with their emotional problems, stress and anxiety (Macht, 2008; Nishitani, Sakakibara, & Akiyama, 2009). At the same time, given their special characteristics, young people are prone to encounter stress, anxiety and poor eating patterns (e.g. eating processed foods); therefore, all of these elements, either solely or in the framework of an inter-
ferential arrangement, may result in the emergence of the unhealthy condition in lifestyle of young people (Kandiah, Yake, Jones, & Meyer, 2006).
Majority of studies investigating the relationship between processed food consumption and mental condition have mainly focused on the analysis of depression (Appleton et al., 2007; Timonen et al., 2004), followed by anxiety which has not sufficiently been considered (Eisenberg, Gollust, Golberstein, & Hefner, 2007). Very few studies have addressed the inter-food relationship in terms of presence and intensity of anxiety; Jacka for instance, who studied the association between magnesium intake and anxiety level, illustrated a reverse association between Mg intake and anxiety score; however, after adjustment for either socioeconomic variables or lifestyle, that relationship did not remain statistically significant (Jacka et al., 2009). Herrick and colleagues (Herrick et al., 2003) investigated depression and anxiety level in women whom consumed meat during pregnancy, found that their cortisol level was enhanced along with increase in meat consumption rate resulting in adverse birth outcomes. The mentioned studies (Herrick et al., 2003; Jacka et al., 2009) failed to mirror completely the anxiety condition caused by food consumption, because the former has only analyzed the relation of a micronutrient and anxiety level and the latter has analyzed the association of increased red meat consumption and serum cortisol levels in pregnant women.

With regard to excessive consumption of processed foods as an indicator of a lifestyle characterized by urbanization, overworking, low resting time, insufficient time for cooking or preparing food and lack of a pertinent study about this issue in Iran, the present study was aimed to assess the relationship between anxiety levels and consumption of processed foods as well as the amount of micronutrient intake.

2. Methodology

2.1. Sample selection

The studied population was young adults aged 18–35 years living in Tehran capital. Adults in this age group are mostly single and socially allowed to eat processed foods, as much as they want without parental limitations. Data gathering was undertaken by face to face interview and completion of relevant questionnaires at their homes’ door. To do this, 15 experienced nutritionists were trained during two sessions about the interview process and how to complete questionnaires. They have given enough explanation to interviewers to help them how to answer the questions (e.g. by showing an album containing food images). To ensure similar accuracy of interviewers, some questionnaires were completed by other researchers. In the present study, the primary estimation of sample size was 2300, but it was reduced to 1782 due to time limitation and noncompliance. For selecting the study sample, we used a cluster sampling technique. To do this, we first considered 22 districts of Tehran as the initial clusters. Then, the first digit of the postal codes of the citizens relating to each district was marked. The exact locations of head-clusters in association with their addresses were specified on the map. Postal addresses of head-clusters were extracted from postal code database of the Iranian Post Organization. The eligible participants were 18–35 years of age individuals and at most two persons from each family were recruited to the study. At the final step, 1782 persons from 22 districts of Tehran City were randomly recruited.

2.2. Dietary assessments

Two dietary assessments with one week interval were carried out using a 24-hour dietary recall to convert dietary intake into the amount of micronutrient and total calorie intake. A Food Frequency Questionnaire (FFQ) was designed to assess processed food intake. The frequency of consumption was asked on the weekly, monthly and annually intervals.

The United States Department of Agriculture (USDA) tables were used to convert consumed food by people into the values of micronutrients. Consumption amounts of processed foods including wieners, sausages, hamburgers, pizzas and generally processed meat products by various factors (such as nugget) were measured by nutritionists through estimating their consumption frequency in weekly, monthly and annually (last year) modes (using FFQ) and then the average consumption rates of foods were recorded in the ordinal scales as “low consumption”; lower than one consumption per week, “medium consumption”: 1 to 2 consumptions per week and “high consumption”: more than two consumptions per week. This classification has been discussed in detail previously (Pereira et al., 2005).

2.3. Anthropometric and demographic assessments

The method of Garmaroudi was used to determine socioeconomic status (Persian version). In this method, the correlation of relevant variables including parental levels of education, house space, house price, having personal car and computer was more than the other variables. Therefore, the above method was defined by adding the total points of those variables (Garmarudi & Moradi, 2009). Anthropometric data including height (without shoes measured by Seca stadiometer, readout accuracy: 0.5 cm), weight (without shoes with the least clothes measured by Seca scale, readout accuracy: 100 g), Body Mass Index (BMI) [kg/m²] measured by nutrition experts.

2.4. Evaluation of anxiety level

The anxiety level was evaluated through Speilburger’s State-Trait Anxiety Inventory (STAI). Relying on Cronbach’s alpha correlation coefficient of 600 normal subjects, Mahram and colleagues have already measured the reliability of state and trait anxiety scale at 91% and 90%, respectively. They also evaluated the other psychometric properties of the Persian version of this inventory and showed that this inventory is an appropriate tool for evaluating the state anxiety level as a condition as well as trait anxiety level as a quality (Mahram, 1993).

2.5. Data analysis

Frequency distribution tables were used to describe the qualitative variables. The quantitative variables were also described using the mean values and standard deviations. Analysis of the relationship among qualitative variables was carried out using the Chi-square and Mann–Whitney tests. In addition, the one-way ANOVA and the Tukey post hoc tests were used for comparing the normally distributed quantitative variables among different study groups. Finally, a proportional odds regression model was employed to examine the impact of consuming processed foods on trait and state anxiety levels, adjusting for the effect of probable confounding variables such as age, sex, total calorie intake, socioeconomic status, BMI, and history of sedative drugs use as well as mental health illness. p-values less than 0.05 were considered statistically significant.

3. Results

Data from 1782 young adults, consisting 966 females (54.2%) and 816 males (45.8%), were analyzed. Table 1 indicates descriptive statistics for different characteristics of the study sample by gender.

Amount of processed food consumption was classified in low, medium and/or high consumption classes. Table 2 indicates the frequency distribution of consumption amount of processed foods for subjects by their gender. Males consumed processed foods two times more than females in high process food intake class. A significant statistical difference was found between males and females in terms of amount of processed food consuming (p < 0.001). A significant statistical
relationship was also observed between the consumption of processed foods and both trait and state anxiety levels (p<0.001).

The results of Mann–Whitney test showed a significant relationship between anxiety intensity and gender (p<0.001). Both genders were categorized in either medium to low or medium to high anxiety levels. Table 3 shows the frequency distribution of trait and state anxiety in terms of gender and in all of the subjects.

Comparison of mean values of micronutrients and energy intake in various groups of processed food consumers revealed that lower levels. Table 3 shows the frequency distribution of trait and state anxiety in terms of gender and all of the subjects.

The present study showed that consuming processed foods increased both state and trait anxieties, even after adjusting for auxiliary variables such as gender, age, total calorie intake, history of mental health illness, and history of sedative drug consumption as well as BMI. The present study showed that consuming processed foods increased both state and trait anxieties, even after adjusting for auxiliary variables such as gender, age, total calorie intake, history of mental health illness, and history of sedative drug consumption as well as BMI. (Table 5). These findings clearly represent a significant relationship between high consumption of processed foods and increased anxiety levels.

4. Discussion

The present study showed that consuming processed foods increased both state and trait anxieties, even after adjusting for auxiliary variables such as gender, age, total calorie intake, history of mental health illness, and history of sedative drug consumption as well as BMI (Table 5).
It was observed that, males were categorized in high consumption level (59.8%) while females were classified to medium amounts of processed foods (50%).

Fast foods are increasingly used in various countries since it was boosted in 1970 (French, Harnack, & Jeffery, 2000). Some studies suggest that consuming processed foods can be one of the environmental factors involved in obesity epidemic during the past three decades (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004; Ogden, Flegal, Carroll, & Johnson, 2002). Despite of no specified direction for casual relationship between processed food intake and obesity, ecological studies have indicated obesity as the more prevalent indicator in regions where processed foods were sold drastically (Maddock, 2004). Our study showed that even after adjusting for total calorie intake, the effect of processed foods on levels of anxiety was obvious which indicated that person who eat more (BMI category highest through 30) just showed a borderline effect for state anxiety (OR = 1.46, 95% CI: 1.01–2.87).

A significant difference was observed between males and females in terms of levels of state and trait anxiety in the course of examining the anxiety intensity (p<0.001). Most of the studied men and women had medium to low and medium to high state and trait anxiety (Table 3). A prevalence rate of 8.35% has already been estimated for anxiety and a 6.4% pathological prevalence rate of severe state anxiety among the Iranian population (Mohammadi et al., 2005). Some studies have shown that people use eating mechanism as a bodily defensive mechanism against mental problems (Jenkins & Horner, 2005), while there was a significant relationship between obesity and mental problems such as lack of self-confidence, depression and anxiety in children and young adults (Zametkin, Zoon, Klein, & Munson, 2004). Our results show that this probable mechanism are refuted after adjusting for total calorie intake and mental health illness status, although we saw a borderline effect for BMI category highest through 30 kg/m² but could be negligible (OR = 1.46, 95% CI: 1.01–2.87). In other words we were able to show that the observed effect is largely due to processed foods.

In the present study, the obtained results reflected a significant relationship between state anxiety and the amount of process food intake in high class (OR = 4.73, 95% CI: 2.89–12.54). After adjusting for confounder variables, there was still a significant relationship between age (OR = 1.08, 95% CI: 1.03–1.25), masculinity (OR = 1.65, 95% CI: 1.15–2.38) and state anxiety. This finding is consistent with other studies regarding the effect of demographic variable such as socio-economic status, and age as well as gender on mental health problems (Hu, Wu, Chou, & Huang, 2012). As another result, the trait anxiety showed a significant relationship with high (OR = 4.91, 95% CI: 2.88–13.99) intake of processed foods that is similar to our finding regarding state anxiety. None of these variables were statistically significant during examination of the relationship between trait anxiety and age, and gender, as well as BMI (Table 5). Heavy smoking (Cuipers, Velasco, & Icaza, 2009) and nicotine dependence (Jamal, Willem Van der Does, Cuijpers, & Penninx, 2012) were associated with elevated rates of depression and anxiety disorders and higher severity of depressive symptoms which are consistent with our findings. These findings are consistent with the results of prior studies representing the relationship between quality of consumed dietary and psychological diseases including anxiety and depression. Psychological diseases are influenced by genetic, hormonal, immunological, biological and neurological factors. Food elements exert direct and potential impacts on nerve physiology (Gómez-Pinilla, 2008). Studies have shown that western diets decline Brain-derived Neurotrophic Factor (BDNF) in the short term which is independent of obesity and nutritional deficiencies (Molteni et al., 2002). BDNF protects neurons against oxidative stress and simplifies neurogenesis (Duman, Heninger, & Nestler, 1997). Thus, diet can affect mental state of persons through changing and adjusting DBNF rate.

Another critical point is that diet can influence the oxidative processes which affect the pathology of some mental disorders including depression in turn (Berk, Ng, Dean, Dodd, & Bush, 2008). Antioxidant-rich diets (Engelhart et al., 2002), for example, seem to play a role to prevent brain changes caused by senescence. Therefore, it can be claimed that food and diet factors can be effective to keep mental health during a human’s lifetime via potential adjustment of the risk of brain event changes. Mental disorders affect the human’s food intake habits, appetite and food preferences through influencing his/her moods which may develop an imperfect cycle by influencing the nutritional adequacy and discharging nutrient storages of the body; so all of these events will result in exacerbation of the status.

Tendency to eat processed foods was an indirect indicator of life-style in the present study, because people who are interested in eating processed foods enthusiastically receive very lower vitamins and minerals than people whose process food intake is very low (p<0.001). On the other hand in confirmation of last studies it reflects low tendency of this group to eat fruits, vegetables and natural foods (Bouillet, Fullerson, Neumark-Sztainer, Story, & French, 2007). However, for males and females, energy (p = 0.009 and p = 0.011 respectively), protein (p<0.001, p = 0.031 respectively), fat, vitamin B12, Fe and Na intake in people with high and medium consumption rates of processed foods were more than that of people with lower consumption rate (p<0.001); it implies the general tendency of such groups to consume more animal source foods (ASF) as the symbol of the Western diet.

Various studies have represented that the amount of salt in the pre-cooked foods is more than the recommended dietary allowances.
effects of processed food consumption on level of anxiety. For example, attempted to control for confounding variable and determine the net


