The association between dietary intake of white rice and central obesity in obese adults

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Abstract

**BACKGROUND:** Obesity has become one of the most important and the fastest growing health and nutritional problem, not only in developed but also in developing countries. White rice consumption causes an increase in postprandial blood glucose and could be a probable reason for obesity. This study was conducted to investigate the association between intake of white rice and central obesity in an Iranian population.

**METHODS:** In the present cross-sectional study, a total of 212 subjects were selected based on convenience non-random sampling procedure. Expert interviewers collected socio-demographic and dietary intake data by a face to face method.

**RESULTS:** We failed to find any significant association between frequency of white rice consumption and body mass index or waist circumference, neither in crude model nor in adjusted models.

**CONCLUSION:** Although there was no significant association between white rice intake and obesity factors in our study, more studies are necessary with larger population and better design.

**Keywords:** White Rice, Body Mass Index, Central Obesity, Diet

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Introduction

In recent years, obesity has become one of the most important and the fastest growing health and nutritional problem not only in developed but also in developing countries. WHO anticipated that globally by 2015, around 700 million adult would be clinically obese and 2.3 billion would be overweight. In Iran, the prevalence of weight problems [Body mass index (BMI) > 25] was 63.9% in women and 49.7% in men. Obesity as a situation with excess body fat and raise in adipose tissue mass causes several health problem and metabolic diseases. Individuals with BMI > 25 are considered as overweight and people who have BMI > 30 are considered obese. But BMI does not provide any information about proportion of fat, bone and muscle mass or body fat distribution. However, recent studies have revealed that abdominal fat is more important in prediction of metabolic diseases than subcutaneous fat. Furthermore, central obesity is more closely associated with all cancers, cardiovascular risk and metabolic disorders such as hypertension, hyperlipidemia and diabetes. Some studies have reported that waist circumference measurement for central adiposity is very specific and sensitive. Although there are some sophisticated techniques for assessment of central obesity, waist circumference measurement as an anthropometric indicator, is a simple easy to use and low cost method for evaluation of abdominal fat in epidemiological studies.

Dietary factors are associated with overweight and obesity; therefore, dietary intervention could be a target for obesity prevention. High consumption of fiber which is found in fruit, vegetable and grain has important role in dietary interventions. Previous studies showed that high consumption of whole grain in the diet, lead to lower energy intake, decrease hunger and raise satiety. However, most of the grains are consumed after removing the outer layers and just starch rich endosperm remains. While whole grains...
consumption is associated with a reduction in developing many metabolic diseases such as diabetes, cardiovascular disease, stroke and cancers, refined grains because of their high amount of carbohydrates at least partly are responsible for current obesity problem. Carbohydrate as the most important source of energy in the diet associated with postprandial blood glucose. Glycemic index (GI) shows the ability of carbohydrate foods in raising the postprandial blood glucose. Consumption of low GI foods contributes to reduce body fat and control obesity. However, there are some dissimilar results.

White rice consumption causes an increase in postprandial blood glucose as compared with brown rice. In Iranian diet, white rice is one of the most important sources of energy and carbohydrate. Previous studies in Iran investigated the association between whole grain consumption and metabolic syndrome but most of the studies have done on western population which is different in genetic or life style. To the best of our knowledge there is no study on white rice consumption and central obesity in Iranian population. Hence, the study aimed to explore the association between intake of white rice and central obesity in an Iranian population.

Materials and Methods

Study Population
We conducted a cross-sectional study concerning obese or overweight Iranian adults (BMI > 25) who were visited in Salamt clinic in 2009. People with insufficient information about socio-demographic data, family history, or dietary records were excluded from this survey. A sum of 212 men and women aged 18 to 56 years were selected based on convenience non-random sampling procedure. After explanation of the study protocol for participants, each one was asked to sign the consent form.

Assessment of variables
In a face-to-face method, expert interviewers collected socio-demographic characteristics including age, education and income, medical history, smoking habits and medication use. Weight and height measurement was completed in barefoot and light clothes. Participants’ height measurement was done by a fixed metal ruler to the nearest 0.1 cm and weight measurement was done by a digital scale to the nearest 0.1 kg. BMI was calculated as a measure of obesity, and waist circumference was measured as a central obesity indicator. BMI was calculated as weight (kg) divided by height square (m²). WC was measured horizontally between the iliac crest and lowest rib margin and hip circumference was measured at the maximum protrusion. Waist to hip ratio (WHR) was calculated as WC (cm) divided by hip circumference (cm). Dietary intake of study participants was evaluated with food frequency questionnaire (FFQ).

Statistical methods
For all statistical analyses, SPSS for Windows (version 15; SPSS Inc., Chicago, IL., USA) was used. To compare means of continues variables between white rice consumption groups we applied Student’s t-test and for categorical variables chi-square test was used. Linear regression was employed to discover the associations between white rice consumption and obesity factors in different models. In first model, the association was adjusted for age, sex and in the second model further adjustment was done for dietary intake.

Results

Table 1 shows the characteristic of study population separated by frequency of white rice consumption per week. There was no difference in age, sex and adiposity indicators between people who consumed white rice less than 7 times per week and those who consumed more than 7 times per week. Comparison of other dietary factors such as fruit, vegetable, dairy and pulses was not different between two groups.

Multivariate adjusted regression models for obesity indicators and frequency of white rice consumption per week are presented in table 2. We did not find any significant association between frequency of white rice consumption and BMI or central obesity in crude model or in adjusted models.

| Table 1. Characteristic of study population separated by frequency of white rice consumption per week |
|---------------------------------------------------------------|
| **Less than 7 time per week** | **More than 7 time per week** | **P** |
| Age (years) | 38.3 ± 14.4 | 32.2 ± 11.2 | 0.001 |
| Female (%) | 66.9 | 59.6 | 0.095 |
| Smoking (%) | 9.3 | 8.9 | 0.122 |
| Weight (kg) | 78.3 ± 16.7 | 76.4 ± 20.3 | 0.477 |
| Body mass index (kg/m²) | 30.1 ± 6.4 | 29.0 ± 8.3 | 0.353 |
| Waist circumference (cm) | 88.4 ± 14.1 | 85.0 ± 15.8 | 0.182 |
| Waist to hip ratio | 0.82 ± 0.07 | 0.81 ± 0.07 | 0.284 |
Table 2. Multivariate adjusted regression for obesity factors and frequency of white rice consumption per week

|                          | Less than 7 time per week | More than 7 time per week* | P    |
|--------------------------|----------------------------|-----------------------------|------|
| Weight (kg)              |                            |                             |      |
| Crude                    | 1.00                       | -0.049 (-7.042–3.328)       | 0.481|
| Model 1                  | 1.00                       | -0.001 (-5.030–4.972)       | 0.991|
| Model 2                  | 1.00                       | 0.052 (-3.341–7.240)        | 0.468|
| Body mass index (kg/m²)  |                            |                             |      |
| Crude                    | 1.00                       | -0.071 (-3.131–1.004)       | 0.312|
| Model 1                  | 1.00                       | 0.000 (-1.970–1.967)        | 0.999|
| Model 2                  | 1.00                       | 0.042 (-1.464–2.732)        | 0.552|
| Waist circumference (cm) |                            |                             |      |
| Crude                    | 1.00                       | -0.112 (-8.564–1.637)       | 0.182|
| Model 1                  | 1.00                       | -0.025 (-5.541–4.003)       | 0.750|
| Model 2                  | 1.00                       | -0.017 (-5.873–4.786)       | 0.840|
| Waist to hip ratio       |                            |                             |      |
| Crude                    | 1.00                       | -0.090 (-0.036–0.011)       | 0.284|
| Model 1                  | 1.00                       | -0.018 (-0.025–0.020)       | 0.824|
| Model 2                  | 1.00                       | -0.028 (-0.028–0.020)       | 0.745|

* B (95% confidence interval)
Model 1: Adjusted for age, sex
Model 2: Adjusted for age, sex and dietary intake

Discussion

In this cross-sectional study, we failed to find any association between frequency of rice consumption and body weight, BMI or central obesity. Rice is a staple food widely used in the world, especially in the eastern countries and Iran. It is an important source of carbohydrate, protein, minerals and vitamins. Recently, most of the rice has been processed and refined. During refining process, bran and germ are removed and just starchy endosperm remains in white rice.

Whole grains because of having some biological active elements including dietary fiber, vitamin E, folate, magnesium and other elements are the main components for a healthy diet. In contrast, refined-grains, due to removing of these elements, are typically rich in energy and poor in nutrient content, which are accused for increasing the risk of chronic disease and obesity. Refining grains changes the value of the carbohydrates to a higher GI and GL (Glycemic load). Previous studies proposed that rapid absorption of glucose after consumption of high GI foods could lead to a sharp raise in blood glucose and insulin level, thus, glucose enters the body tissues, inhibits lipolysis and induces lipogenesis and obesity.

In line with some of the previous studies, white rice consumption was not associated with obesity factors in the current study. A prospective study did not find any difference in weight gain as a result of consumption of whole or refined grain breakfast. Another study showed that rice intake with reference to other carbohydrate sources had lower potential to increase in postprandial glucose. Moreover no association was found between metabolic risk factors and refined grain consumption. However, these findings conflict with studies that showed dietary pattern that include white rice may be associated with obesity and intake of refined-grain foods was positively related to weight gain and higher visceral adipose tissue. On the other hand, another study recently revealed that rice intake was inversely associated with weight gain.

This discrepancy could be explained by the different source of refined-grains. In Vietnamese, the GI of white rice was reported from 86 to 109 but a review article indicated that the mean GI for white rice was 64. A probable reason for finding no association between obesity factors and white rice in the current study could be explained by the GI of Iranian rice. Previous investigations showed that there are some kinds of Iranian rice with low GI (44 ± 9 for Binam rice and 52.2 ± 5.1 for Sorna pearl rice). They supposed that the amylase content of Iranian rice was the reason for the low GI of this rice.

Another reason for these results could be explained by some studies indicated that rice protein possesses an important function in the triglyceride metabolism, that may improve body weight and adiposity, so it could reduce the negative effect of high GI rice.

In this study we should consider several limitations. First, this study with a cross-sectional...
design was not appropriate to conclude about causality. A further longitudinal study is necessary for stronger conclusion. On the other hand, we used a self reported qualitative FFQ for dietary intake, so we could not estimate the energy intake and it has been reported that obese individuals would like to underreport their dietary intake.41 In conclusion, although there was no significant association between white rice intake and obesity factors in our study, more studies are necessary with larger population and better design.

**Conflict of Interests**

Authors have no conflict of interests.

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