Research Journal of Biological Sciences 2 (3): 252-255, 2007

Effect of Rice Bran Powder on Blood Glucose Levels and Serum Lipid Parameters in Diabetes Patient II

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Abstract: Diabetes mellitus remains as a significant universal health problem. Globally, the prevalence of diabetes mellitus is projected to growth from 135 million in 1995 to 300 million in 2025. The main aim of this study was determination of the effect of rice bran on blood glucose level and plasma lipid parameters in type II patients. This study was Double Blind non cross-over Trial 60 Diabetic Patient which hadn't renal and liver disorder and high hypertension after physical exam selected and then randomly divided to two intervention and control group first group intake 10 g soluble rice bran 2 period a day (at morning and before sleeping) and second group intake placebo blood glucose and plasma lipids levels were determined before and after study The data were analyzed by paired t-test and ANOVA, using SPSS and Food processor. The fasting serum Glucose level and 2 h after eating were reduced significantly ($p<0/001$). Triglyceride levels were reduced ($p<0/01$) and HDL were increased significantly too ($p<0/05$).LDL and cholesterol had reduced too but not significant ($p>0.05$). Consequently, rice bran can be used as nutritional supplements for the control of diabetes mellitus patients.

Key words: Diabetes type II, rice bran, blood glucose, plasma lipids

INTRODUCTION

The prevalence of Diabetes Mellitus (DM) is very high worldwide. According to the World Health Organization in 2000 the worldwide prevalence of DM was 171, 000, 000 (Broumand, 2007) and yet it remains as a significant universal health problem. Globally, the prevalence of diabetes mellitus is projected to grow from 135 million in 1995 to 300 million in 2025; Mshelia *et al*., (2007). It is estimated that more than 1.5 million people with diabetes living in Iran (Azizi, 2003). The most important complication of Type 2 Diabetes Mellitus (DM) is Coronary Heart Disease (CHD) increased mortality and morbidity as compared to the non-diabetic population (Alireza *et al*., 2006). As diabetes mellitus has become a monumental problem and a major health concern throughout the world, various programmers developed by Iran to control and managing the diabetes, which involves screening and education for type 2 diabetes patients and adults at risk with diabetes (Azizi *et al*., 2003). Some researches illustrate that use of 20-30 g fiber can decrease risk of heart-vascular to 25% and other studies showing that fabric diet can affect on blood glucose and serum lipid parameters. dietary fibers from cereals may reduce postprandial lipemia in humans to a variable extent (Qureshi *et al*., 2002).There are two kinds of nutritional fiber: soluble and insoluble. Soluble fiber such as rice bran plays an important role in decreasing of cholesterol and controlling of blood glucose. Fibers have been shown to have significant effect on absorption of nutrients with producing SCFA (Short Chain Fatty Acid) from colon. These fatty acid can effect on glucose metabolism and cholesterol synthesis. Cereals usually have phytate component which can decrease ingestion of carbohydrates and have negative relation with ingestion of carbohydrate and glycemic response.

There are 2 kinds of nutritional fiber: Soluble and insoluble which soluble fiber such as rice bran plays an important role in decreasing of cholesterol and controlling of blood glucose. Fibers have been shown to have significant effect on absorption of nutrients with producing SCFA (Short Chin Fatty Acid) from colon. These fatty acid can effect on glucose metabolism and cholesterol synthesis. Cereals usually have phytate component which can decrease ingestion of carbohydrates and have negative relation with ingestion of carbohydrate and glycemic response. (Qureshi *et al*., 2002).

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Also rice bran have tocopherol, tocotrienol, gama oryzanol, polyphenol and lipase which most of them play an important role in modulating hyperglycemic consequences such as lipid peroxidation Lipase shows increase changing of lipid to fatty acid and lead to fast analyses of triglyceride (Qureshi *et al*., 2001). According to nutrients component each 100 g of rice bran have 381 kcal energy, 9.85 g moist, 54.93 g carbohydrates, 17.61 g protein, 1.4 g lipid, 7.7 g fiber, 21.4 g nutrient fiber, about 21.59 insoluble fiber and 31.9soluble fiber, lipase and tripcine (Movahedie and Rosta, 1998).

There are different ideas about effect of rice bran on blood glucose and lipids. It was showed rice bran can decrease blood glucose, total cholesterol and triglyceride (Qureshi *et al*., 2002 a, b) whereas some studies had showed it had not any effect on blood lipid and serum glucose (Ann and Noreen, 1998; Sanders and Reddy, 1992). The main aim of this study was to investigate the effects of rice bran on glucose levels and serum lipids parameters in diabetic patients (type II).

MATERIALS AND METHODS

This study was Double Blind clinical Trial, 60 Diabetic Patients (nonpregnant) female and male which were nonsmokers, age range 30-65 y, referring to diabetes center of Booali hospital of Ardabil selected for this research. The protocol was approved by the Research Review Board of Ardabil University and informed consent was obtained.

Inclusion criteria were include: Diabetic type II patients which receive Glibenclamide or metformin, Subjects were excluded if they were taking medication that might affect serum lipids (thyroid or steroid hormones, beta blockers, prednisone or diuretics), uncontrolled hypertension (systolic blood pressure>200 mm Hg or diastolic blood pressure>110 mm Hg), symptomatic coronary or vascular disease, thyroid disease, hepatic abnormality or renal disease (cretin<0.4 mg dL^{-1} and abnormal SGOT) and None had experienced weight change of >4.5 kg in the preceding 6 mo. After physical exam and laboratory assess patients were selected and then randomly randomly assigned to groups intervention and control group. First group intake 10 g soluble rice bran 2 time a day (morning and before sleeping) and the second group intake placebo. From each patient 5 mL blood sample were collected for assessment of blood glucose and lipids levels and also from all patients 24 h recall of food were taken. Then weight, height and blood pressure of patients and their activity levels at each day were determined. Patients receive 20 g/day rice bran or placebo for 30 days.

Table 1: Index of age, (BMI) high and weight of patients

Intervention		control		Groups
SD	x	SD	x	variable
10	45	9.3	50	Age (year)
3.5	27.3	4	26.2	(BMI) kg m^{-2}
3.9	157.5	4	155.2	High (cm)
7.7	74.3	9.1	72.3	Weight (kg)

Table 2: Baseline macronutrient intake in each group before and after study

Intervention		Control		Groups macronutrient
Before	After	Before	After	Intake
1888±221.1	1884±233.2	1665±251	1606±240.8	Energy (Kcal)
260±41	258±32	240±51	234.9±31.2	Carbohydrate (gm)
55±6.5	55±6.0	56±7	55±6.3	Protein (gm)
139±3.1	138.5±4.1	183.3±3.1	37.5±8.2	Lipid (gm)

Screening serum lipid levels (Triglyceride, HDL, cholesterol and LDL) were measured twice before and after of the study and blood glucose (The fasting serum glucose level and 2 h after eating) and activity levels and 24 h recall of food were checked each 15 days. The data were analyzed by paired t-test and ANOVA using SPSS and Food processor.

RESULTS

Out of the 60 subjects entered the study, the data of 3 males and 27 females were used as intervening group with average age of 45±10 y were collected. Ten males and 20 females in control group with average age of 50±9.3 y used for the final analysis. Average body weight in case group was 74±7.7 kg and in control group was 72.2±9.1kg, height in case group was 157 ± 3.9cm and in control group was 155.2±4cm, the average body mass index in case group was 27±3.5 kg m^{-2} and in control group was 26.2±4 kg m^{-2}. Index of Age, (BMI), height and weight of patients are described in Table 1.

Analysis of food records showed that dietary intake did not change over the study interval. The mean energy, fat, protein and carbohydrate intakes were not significantly different among groups. Baseline macronutrient intake in each group is described in Table 2.

Mean blood glucose of Serum declined 34.8±24.07 in the rice bran group as per ANOVA analysis; differences were statistically significant which showed in Table 3. Differences between case and control groups showed that there were no differences in mean serum blood glucose before, after and medium of study time.

There were significant decreases in serum Triglyceride and, HDL but not cholesterol and LDL.HDL in the rice bran group had increased significantly during the 4-weak period. Serum Triglyceride declined in the rice

Table 3: The fasting serum Glucose level and 2 h after eating before, medium and after intervention (in intervention group)

	After intervention		Medium intervention		Before intervention		
Results	X	SD	X	SD	X	SD	Time of assessing of variable
p<0.001	142.6	45.1	159.8	66.2	177.4	69.08	Blood glucose fasting
p<0.0001	243.7	64.9	251.7	68.2	270.03	87.4	Blood glucose 2 h after eating

Table 4: The fasting serum Glucose and Triglyceride, HDL, cholesterol, LDL before and after study (in intervention group)

Results	After study	Before study	Variable
p<0.001	142.6±45.1	177.4±69.8	Blood glucose mg dL^{-1}
p=NS	204±31	215±41	Cholesterol mg dL^{-1}
p<0.05	236.6±75	293.6±88	Triglyceride mg dL^{-1}
p<0.01	53.5±14	46±13	HDL (mg dL^{-1})
p=NS	120±43	160±29	LDL (mg dL^{-1})

bran group The fasting serum Glucose and Triglyceride, HDL, cholesterol, LDL before and after study (in intervention group) are described in Table 4.

DISCUSSION

The fasting serum Glucose level and 2 h after eating were reduced significantly (p<0/001). Triglyceride levels were reduced and HDL were increased significantly too (p<0/05 and p<0/01, respectively) LDL. Cholesterol level reduced too but not significantly. Results of this study indicate that the fasting serum Glucose level and 2 h after eating were reduced significantly (p<0/001). Triglyceride level was reduced significantly (p<0/05) whereas HDL was increased significantly (p<0/01). LDL and cholesterol had reduced too but not significant. Qureshi *et al.* (2001) fed stabilized rice bran and its fractions for 60 days to diabetic patients. Rice bran water soluble and rice bran fiber concentrate with plus AHA step-1diet to determine possible effect on serum hemoglobin, carbohydrate and lipid parameters, their results show that the fasting serum glucose levels were reduced significantly (p<0.001) with stabilized rice bran (9%), rice bran water soluble (29%) and with rice bran fiber concentrated (19%), also their results show that with stabilized rice bran and its fractions, rice bran water soluble and rice bran fiber concentrates triglyceride levels and HDL were increased , cholesterol and serum Glucose were reduced significantly which is matched with our study (Qureshi *et al.*, 2002). Other researches reminiscent of Qureshi *et al.* (2001) showed that Novel Tocotrienols of Rice Bran can Suppress Cholesterogenesis in Hereditary Hypercholesterolemic Swine. Four groups were fed orn-soybean control diet; supplemented with 50 μg of either TRF25-tocotrienol, d-P21-T3 or d-P25-T3 per g for 6 week. Group 5 was fed the control diet for 6 week and served as a control. After 6 week, serum total cholesterol was reduced 320-38%, low density lipoprotein cholesterol was reduced 35-43%, apolipoprotein B was reduced 20-28%, platelet factor 4 was reduced 12-24%, thromboxane B2 was reduced 11-18%, glucose was reduced 22-25% (p<0.01), triglycerides were reduced 15-19% and glucagons was reduced 11-17% (p<0.05) in the treatment groups compared to the control. Cholesterol and fatty acid levels in various tissues were lower in the treatment groups rather than in control. After being fed the tocotrienol-supplemented diets, two swine in each group were transferred to the control diet for 10 week. The lower concentrations of serum lipids in these four treated groups persisted for 10 week (Qureshi *et al.*, 2001).

The nearest achievement in In other study is full-fat rice bran was compared with oat bran and a rice starch placebo in hyperlipidemic humans to see if it might have a role in the treatment of hyperlipidemia. Moderately hypercholesterolemic (5.95-8.02 mmol L^{-1}), nonsmoking, nonobese adults were studied in a 6 week, randomized, double-blind, noncross-over trial. Three groups added 84 g d^{-1} of a heat-stabilized, full-fat, medium-grain rice bran product (n = 14), oat bran product (n = 13) or rice starch placebo (n = 17) to their usual low-fat diet. Serum cholesterol, triglycerides, HDL-Cholesterol (HDL-C), LDL-Cholesterol (LDL-C), apoA1 and apoB were measured before and at the end of the supplementation period. Serum cholesterol decreased significantly (p<0.05) by 8.3±2.4% and 13.0±1.8% in the rice bran and oat bran groups, respectively, but there was no change in the rice starch group. There was no consistent effect on triglycerides within each group and HDL-C and apoA concentrations did not change.

The LDL-C: HDL-C ratio decreased significantly in the rice bran and oat bran groups. Stabilized, full-fat rice bran or oat bran added to the prudent diet of hyperlipidemic adults, similarly reduced cholesterol and LDL-C and improved lipid ratios in 78% of these individuals. Rice bran, as well as oat bran, should be included in the prudent diet of individuals with hyperlipidemia (Ann and Noreen, 1998).

Sanders and Reddy (1992) compared Influence of Rice Bran and wheat bran on plasma lipids and lipoproteins in Human volunteersthier results showed that rice bran declined serum Triglyceride and had no effect on cholesterol.

Kestin *et al.* (1990) were compared the effects of adding 11.8 g dietary fiber/d from each of three cereal brans (wheat, r ice and oat) to a low-fiber diet for 4 week

each in 24 mildly hypercholesterolemic men. Plasma total- and low-density-lipoprotein- cholesterol concentrations were significantly lowered only by oat bran. Compared with wheat bran, the ratios of plasma high-density-lipoprotein cholesterol to total cholesterol and of apolipoprotein A-I to B were significantly increased with oat bran (both by 4.7%, P less than 0.05) and rice bran (2.3%, P less than 0.05 and 3.9%, Pless than 0.05, respectively). Blood pressure, blood glucose and serum insulin responses to a common test meal were unaltered. Oat and rice bran exert a small but potentially useful effect on plasma lipoprotein risk factors for cardiovascular disease.

CONCLUSION

Results of this study showing that when rice bran, added to the prudent diets of moderately hyperlipidemic individuals, produces significant reduction in triglyceride levels and improvement in the HDL ratio but not in serum cholesterol or LDL, seeing that rice bran have some insoluble fiber include cellulose and hemicelluloses which can band to Bile Acids suggested that effect on cholesterol therefore no differences seen cholesterol level.

ACKNOWLEDGMENT

We thank all personnel of diabetes center, Ardabil who contributed their time and love affection to come through this research particularly Dr Khodamoradzadeh and Mrs taghizadeh nurse of center.

The study was supported in part by research council of Ardabil University of Medical sciences whose cooperation will be highly appreciated.

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