ORIGINAL ARTICLE

The Effect of Different Types of Iranian Breads on Metabolic and Cardiovascular Responses in Type 2 Diabetic Patients

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ABSTRACT

OBJECTIVE: Since bread is the main source of food in Iran, we aimed to assess the effect of four types of Iranian breads on metabolic and cardiovascular responses before and during 15, 30, 60, 90, 120 and 180 minutes of consumption in type 2 diabetic patients.

MATERIALS AND METHODS: Ten type 2 diabetic patients (6 women and 4 men) with mean age of 51 ± 9.8 years and mean BMI of 31.9 ± 1.19 kg/m^2 who were taking oral antidiabetic agents (Sulfonylurea or/and Metformin) or an antidiabetic dietary regimen alone were recruited in this study. After obtaining informed consent, the subjects received 60 g (2 serving) one of the four types of traditional breads (Sangak, Taftoon, Barbari, Lavash) in four visits. Blood samples were collected before and 15, 30, 60, 120 and 180 minutes after beginning of eating. 24-hour dietary recalls were obtained at the first, middle and end of the study.

RESULTS: The mean of blood glucose after consumption of all types of breads differed significantly at 60, 90, 120 and 180 min. At 180 min after ingestion of Sangak ($P = 0.023$), Taftoon ($P = 0.002$) and Lavash ($P = 0.000$), a significant difference was observed compared with before ingestion. Result indicated that Barbari bread has the best effect on fasting blood glucose.

Conclusion: Our findings indicated that Barbari bread has the best effect on control of blood glucose and consumption of whole-grain breads (Sangak and Barbari) may reduce glucose excursion, improving glycemic control and as a supplementary means of diabetic therapy.

KEYWORDS: Type 2 diabetes, Blood glucose, Iranian bread.

INTRODUCTION

Diabetes mellitus is one of the important health problems with microvascular and macrovascular long term side effects that make morbidity and mortality (1). Over 230 million people worldwide are thought to be affected by type 2 diabetes mellitus and the number is expected to increase two to three-fold in the next 10 years. This trend is particularly evident in developing countries (2). UKPDS study showed each 1% reduction in updated mean HbA1c was associated with reductions in risk of 21% for any end point related to diabetes (3).

Effective factors on postprandial blood sugar rate are: carbohydrate structural, fiber content, food composition, tannen, phytat, alpha amylase inhibitors and many other materials in

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cereals, grains and starchy vegetables (3).

There is not enough information about the effect of different foods before and during 3-hour postprandial. Since bread is the main source of food in Iran, we aimed to assess the effect of four types of Iranian breads on metabolic and cardiovascular responses before and during 15, 30, 60, 90, 120 and 180 minutes in type 2 diabetic patients.

MATHERIALS AND METHODS

In this clinical trial study, 10 type 2 diabetic patients (6 women and 4 men) with a mean age of 51 ± 9.8 years and BMI of 31.9 ± 1.19 kg/m^2 who were taking oral antidiabetic agents (Sulfonylurea or/and Metformin) or an antidiabetic dietary regimen alone were recruited consecutively.

The inclusion criteria for this study were: Type 2 diabetes mellitus, age 40-60 years, fasting plasma glucose >126 mg/dl and <250 mg/dl, total plasma cholesterol (TC) 200-240 mg/dl and serum triglyceride (TG) 200-400 mg/dl. Exclusion criteria were renal failure, hypertension, other endocrine disorders, gastrointestinal disorders and intake of insulin. Moreover, subjects who had changed their diet and daily physical activity were excluded.

The University Ethics Committee approval was obtained prior to study enrollment. Informed consent was obtained in all cases. At first visit demographic and clinical information were obtained (Table 1). The subjects received 60 g (2 serving) of one of the four types of traditional breads (Sangak, Taftoon, Barbari, Lavash) in four visits. Blood samples were collected before and 15, 30, 60, 120 and 180 minutes after beginning of eating. 24-hour dietary recalls were obtained at the first, middle and end of the study.

Plasma glucose was measured by the glucose Anzymatic method with a glucose analyzer.

Statistical Analyses: Analysis of variance with repeated measures ANOVA and paired T-test were applied for comparing variables at baseline and the end of study. Data were shown by means $\pm$ SD. Statistical analysis was performed using SPSS 11.5, Chicago IL. The level of significance was considered $P < 0.05$.

RESULTS

The four types of breads were well tolerated, without any complaints or side effects. Result of the 24 hours recall at the end of the 4 nutritional periods demonstrated that dietary intakes of total energy were unchanged (Table 1). The mean of blood glucose after consumption of all types of breads differed significantly at 60, 90, 120 and 180 min (Table 2). At 180 min after ingestion of Sangak ($P = 0.023$), Taftoon ($P = 0.002$) and Lavash ($P = 0.000$) a significant difference was observed compared with before ingestion. Result indicated that Barbari bread has the best effect on control of blood glucose (Table 3).

Table1- The Mean and SD of calorie intake in four times 24 dietary recalls

24 Dietary Recalls	Calorie	
	X ± SD	Number
1	2150 ± 255	10
2	2174 ± 276	10
3	2142 ± 225	10
4	2160 ± 230	10

Table 2- Comparison of blood glucose changes (unit) in four types of Iranian breads

Type of Bread	Time				
	Difference Before-After 30 min	Difference Before-After 60 min	Difference Before-After 90 min[*]	Difference Before-After 120 min[*]	Difference Before-After 180 min[*]
Barbari	30.9 ± 11	62.6 ± 28.5	46.5 ± 17.2	9.2 ± 10.7	14.1 ± 6.3
Sangak	35.9 ± 17.1	70.3 ± 26.7	81.1 ± 31.9	40.7 ± 22.8	9.7 ± 1.2
Taftoon	25.4 ± 14.5	45.4 ± 20.8	89.7 ± 32.4	61.6 ± 23.6	11.3 ± 8.5
Lavash	31.8 ± 12.6	52.1 ± 19.6	98.6 ± 35.1	75.9 ± 27.6	49 ± 27.3

[*] Significant between four groups ($P < 0.05$)

Table 3- Comparing theeffect of four types of Iranian breads on the mean of blood glucose

Type of Bread	before	After 15 min	After 30 min	After 60 min	After 90 min	After 120 min	After 180 min
				Time			
Sangak	137.5 ± 55.9	152.7 ± 59.1	173.4 ± 68.6	207.8 ± 75.9	218.6 ± 69.4	178.2 ± 57.9	147.2 ± 54.3
Barbari	134.7 ± 26.8	148.5 ± 27.2	165.6 ± 26.1	197.3 ± 28.8	181.2 ± 30.1	143.9 ± 23.6	148.8 ± 51.3
Taftoon	137.9 ± 14.6	148.3 ± 12.8	163.3 ± 14.6	183.3 ± 18.7	227.6 ± 30.5	199.5 ± 18.6	149.2 ± 15
Lavash	132.9 ± 12.2	148.3 ± 12.8	164.7 ± 12.9	185 ± 19.1	231.5 ± 32	208.8 ± 23.3	181.9 ± 23.7

DISCUSSION

In the present study, we demostrated that consumption of whole-grain bread (Sangak and Barbari) reduces glucose excursion, improves glycemic control and can be used as a supplementary means of diabetic therapy. Some studies show that fiber causes glycemic control in diabetic patients (4) and glucose tolerance in non-diabetic patients (5). Gastric emptying and paracetamol absorption were slower after gel fibre like guar and pectin (6). Viscous types of dietary fiber are, therefore, most likely to be therapeutically useful in modifying postprandial hyperglycaemia (7).

Pick et al. concluded that consumption of oat bran in bread causes improvement in glycemic control, insulin responses and lipid profile (8). In another study, a total of 23 subjects with type 2 diabetes completed two 3-month phases of a randomized crossover study. In the test phase, bread and breakfast cereals were provided as products high in cereal fiber. The result of that study showed high-fiber cereal foods did not improve conventional markers of glycemic control or risk factors for CHD in type 2 diabetes over 3 months (9). However, we found significant difference of consumption of high fiber breads (Sangak & Barbari) in type 2 diabetic patients, but these results were not compared with non-diabetic subjects.

The American Diabetes Association found that use of low glycemic foods may reduce postprandial hyperglycemia (10). Several studies confirmed that consumption of dietary fiber was inversely related with glycemic index and glycemic load, so a low glecemic index diet can change beta cell function and lipid profile (11). The present study showed that breads with higher fiber had the better impact on blood glucose.

Increasing the intake of dietary fiber may also indirectly protect against insulin resistance by preventing obesity (12). Moreover, lowering carbohydrate intake increases postprandial serum free fatty acids (FFA) that causes reducing glycemic responses and defects glycemic control in diabetic subjects. By contrast, low glycemic index diets reduce serum FFA and improve glycemic control (13).

Brodribb and Humphreys noted that addition of wheat bran to foods did not seem to influence glycemic control or risk factor for CHD in subjects with type 2 diabetes (5).

Nevertheless, in the short term, no major change should be expected in glycemic control (14), but in our study, the effect of fiber in Sangak and Barbari breads was considerable on blood glucose. Our results showed that Barbari has better effect on blood glucose than Sangak, but since several factors are involved in diabetes, we must notice that the salt of Barbari is more than Sangak which has unfavorable effects on diabetes in long term.

These results are consistent with the results of Afshari et al. (15). They demonstrated that the index glycemic of Barbari is 25% less than Sangak. Overall, they concluded that index glycemic of Iranian traditional breads is low, so it is important to substitute these breads with refined cereals.

One of our limitations was the short duration of trial. Larger studies are needed for the best establishment of the effect of breads.

Finally we found consumption of whole-grain bread (Sangak and Barbari) may reduce glucose excursion, improve glycemic control and be used as a therapeutical means in diabetic patients.

REFERENCES

1. Grimalgi A, Sachon C. Self Monitoring Blood Glucose In Type 2Diabetes: For Whom And Why?Which proof? Diabetes Meta 2003;29(2):S42-6.

2. Amos AF, McCarty DJ, Zimmet P. The rising global burden of diabetes and its complications: estimates and projections to the year 2010. Diabetic medicine 1997;14(S5):S1-S85.

3. Stratton IM, Adler AI, W Neil HA, Matthew DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. BMJ 2000;321:405-12.

4. Bosello O, Ostuzzi R, Armellini F, Micciolo R, Scuro LA. Glucose tolerance and blood lipids in bran-fed patients with impaired glucose tolerance. Diabetes Care 1980;3(1):46.

5. Brodribb AJ, Humphreys DM. Diverticular disease: three studies. Part III - Metabolic effect of bran in patients with diverticular disease. British medical journal 1976;1:428-30

6. Holt S, Carter DC, Tothill P, Heading RC, Prescott LF. Effect of gel fibre on gastric emptying and absorption of glucose and paracetamol. The Lancet 1979;1(8117):636-9.

7. Jenkins DJ, Wolever TM, Leeds AR, Gassull MA, Haisman P, Dilawari J, et al. Dietary fibres, fibre analogues, and glucose tolerance: importance of viscosity. British medical journal 1978;1:1392.

8. Chandalia M, Garg A, Lutjohann D, Bergmann K, Grundy S, Brinkley L. Beneficial effects of high dietary fiber intake in patients with type 2 diabetes mellitus. NEJM 2000;342:1392-8.

9. Jenkins DJA, Kendall CWC, Augustin LSA, Martini MC, Axelsen M, Faulkner D, et al. Effect of wheat bran on glycemic control and risk factors for cardiovascular disease in type 2 diabetes. Diabetes Care 2002;25(9):1522

10. Jennie BM, Susan H, Peter P, Stephen C. Low-glycemic index diets in the management of diabetes. Diabetes Care 2003;26:2261-7.

11. Jenkins AL, Jenkins DJA, Wolever TMS, Rogovik AL, Jovanovski E, Bozikov V, et al. Comparable postprandial glucose reductions with viscous fiber blend enriched biscuits in healthy subjects and patients with diabetes mellitus: acute randomized controlled clinical trial. Croatian Medical Journal 2008;49(6):772.

12. Juntunen KS, Laaksonen DE, Poutanen KS, Niskanen LK, Mykkanen HM. High-fiber rye bread and insulin secretion and sensitivity in healthy postmenopausal women. American Journal of Clinical Nutrition 2003;77(2):385-91.

13. Wolever TMS. Carbohydrate and the regulation of blood glucose and metabolism. Nutrition reviews 2003;61(5):40.

14. Kabir M, Oppert JM, Vidal H, Bruzzo F, Fiquet C, Wursch P, et al. Four-week low-glycemic index breakfast with a modest amount of soluble fibers in type 2 diabetic men. Metabolism 2002;51(7):819-26

15. MS degree theseis: Afshari Sh, Measurement of Index Glycemic in different breads of Sangak, Barbari, Taftoon, Sadri rice and lentil in healthy young subjects, 1374, Shahid Beheshti University of Medical Sciences.