

GLYCAEMIC INDEX OF PAKISTANI STAPLE FOODS IN MIXED MEALS FOR DIABETICS

Pages with reference to book, From 60 To 62

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ABSTRACT

Glycaemic index of local staple foods was determined. In first phase, the post prandial blood glucose response of isocaloric portion of wheat chapati and gram flour (baisan) chapati, were compared in 11 type ii diabetic patients as a part of mixed meal in fasting state, alternately. The glycaemic index of baisan chapati was 39 as compared with wheat chapati. In second phase of the study, 22 type II diabetic patients were given isocaloric portions of wheat chapati and boiled rice as a part of mixed meal alternately. The glycaemic index of rice was 98 as compared with wheat chapati. This study favours the belief that baisan chapati is better and refutes that rice is bad for diabetics. It also upholds that glycaemic index is useful for planning a diabetic diet (JPMA 42: 60, 1992).

INTRODUCTION

The same weight of carbohydrates in different foods can produce widely different blood glucose response. From this emerged the concept of glycaemic index. Tables showing glycaemic index of different foods are now available which can be used for planning diabetic meals¹. The Nutrition Committees of American and Canadian Diabetic Associations recommended that diets for diabetic people be planned according to glycaemic index^{2,3}. Most of the work on glycaemic index has been carried out in western countries^{1,4-8} where wheat flour is consumed in the form of baked bread. Seventy to eighty percent of the people in the subcontinent use wheat flour in the form of chapati and about 20% eat rice as staple food while some use baisan (gram seed flour) as a substitute. There is a general belief that rice aggravates diabetes while baisan is good for diabetics. This study was designed to evaluate the glycaemic indices of these foods as a part of mixed meals in comparison with wheat chapati.

SUBJECTS AND METHODS

Two groups of Type II diabetics were included in the study. Eleven patients in Group I (5 males and 6 females) with an average age of 55.8 (± 8.13) years, mean percent of ideal body weight 118% (± 7.33) and average duration of diabetes of 6.5 years, were given isocaloric meals consisting of baisan chapati made of 62 grams of baisan 228 Kcal or wheat chapati made of 67 grams of wheat flour 228 Kcal randomly one by one for two consecutive days after an overnight fast. Chapatis were taken with 150 grams of yoghurt and tea with 70 ml milk on each day. A fasting capillary blood sample was obtained before the start of meal. All food was taken in 10 to 15 minutes and time was counted when patients started eating food. Capillary blood was obtained from finger prick after immersing the finger in hot water (40°C) for ten seconds to ensure good blood flow¹ by using Autoclix (Boehringer Mannheim) half hourly for three hours. Blood glucose was determined by using Haemoglukotest strips (Boehringer Mannheim, Germany) and reflectance photometer, Reflolux-II (Boehringer Mannheim, Germany). The accuracy of Reflolux-II was checked daily by using control solution provided by the manufacturer. The mean blood glucose was plotted on a graph and area under the curve was calculated for each meal. Twenty-two patients (5 males and 17 females) in Group II with an average age of 54.3 (± 5.21) years,

mean percent of ideal body weight of 124% (± 6.24) and mean duration of diabetes of 7.8 years, were given wheat chapati made of 62 grams of wheat flour (213 Kcal) one by one for two consecutive days after an overnight fast and boiled rice of 62 grams of dry weight (214 Kcal). Both foods were given with 30 grams lentils, cooked with 15 grams of vegetable oil and a cup of tea with 70 ml milk. Glycaemic index was calculated by using same procedure as in part 1 of the study. Statistical analysis was done by using student's "t" test for paired values.

RESULTS

The mean of blood glucose levels in Group 1 are shown in Table I.

TABLE I. Mean of blood glucose response and glycaemic indices for baisen chapati vs wheat chapati in 11 diabetics.

Foods	Mean blood glucose (mg%) at time (hour)							Mean glucose area (mg%hour) ¹	Glycaemic index
	0 Hour	0.5	1.0	1.5	2.0	2.5	3.0		
Wheat chapati	136.2	186.1	204.9	192.9	189.5	169.6	146.9	135	100
Baisen chapati	131.4	*150.7	*159.2	*163.8	*148.5	*131.0	122.7	53	39

*Significant (P < 0.05)

There was no significant difference in the fasting blood glucose for both groups. The peak blood glucose response was seen at one hour for wheat chapati and at one and a half hour for baisen chapati. The postprandial response of baisen chapati was significantly lower than that of wheat chapati at each time point except at 3 hours. The glycaemic index of baisen chapati (39) was significantly lower than that of wheat chapati. The mean blood glucose levels in Group II after ingestion of wheat chapati and boiled rice as a part of mixed meal at all time points for 22 diabetics are shown in Table II.

TABLE II. Mean blood glucose responses and glycaemic indices for wheat chapati vs rice in 22 diabetics.

Food	Mean blood glucose (mg%) at time (hour)							Mean glucose area (mg% hour)	Glycaemic Index
	0 Hour	0.5	1.0	1.5	2.0	2.5	3.0		
Wheat chapati	121.41	131.32	149.73	161.14	159.9	144.55	123.05	73	100
Rice	112.95	143.32	160.0	*145.82	*129.6	*128.18	*108.7	71.5	98

*Significant (P < 0.05)

The peak glucose response with wheat chapati was seen at one and a half hour while with boiled rice it was seen at one hour. There was no significant difference in fasting blood glucose for both groups. The postprandial response of blood glucose was significantly lower with rice at 1.5, 2.5 and 3 hours. There was no significant difference between glycaemic index of boiled rice and wheat chapati.

DISCUSSION

Bread is used as a reference food in most of the studies^{9,10}. In this study wheat chapati is used as a reference food because this is the staple food of 80% of population in the subcontinent. In another study our group has shown that glycaemic index of wheat chapati is less than that of bread (unpublished). The glycaemic index of at least 120 foods and sugars have been determined by six groups of workers around the world^{1,6,8,11}. The glycaemic index of baisen has not been determined so far but that of other beans varies from 40 to 50 as compared with whole wheat¹⁰. The glycaemic index of gram dal was demonstrated to be significantly lower than that of cereals⁷. In another study the mean peak rise in plasma glucose was decreased by 82.1% with Bengal gram dal while wheat and rice

showed reduction only by 25 and 16% respectively, when compared with glucose¹². This study shows that baishn chapati has a significantly lower glycaemic index as compared with wheat chapati and is useful staple food substitute for diabetics. Most of the food items produce higher glycaemic indices when used in ground form. Ground rice produces a much higher blood glucose peak level than does whole rice¹³. Similarly ground carrots produce a more prolonged glucose response than do minced carrots⁹. Baisen, being ground form of gram seed, is peculiar in having low glycaemic index. Injenkin's and others study, the glycaemic index of rice (80) was significantly lower than that of wheat bread in diabetics^{5,14}. Glycaemic index of boiled rice was 73 as compared to white wheat bread. Comparing rice and wheat containing meals in healthy subjects, average blood glucose response of rice was less than that of wheat, though not significant¹⁵. The peak blood glucose rise with wheat chapati occurred at 1.5 hours while peak occurred at one hour with rice^{5,15}. In our study the glycaemic index of rice was not significantly different from that of wheat but peak rise occurred earlier with rice as compared to wheat. Results of present and previous studies indicate that there is no truth in the belief that rice aggravates diabetic status. Coulston et al¹⁶ reported that the glycaemic responses to mixed meals containing different types of carbohydrate sources did not differ significantly. Therefore, the glycaemic index approach may have limited clinical utility. Wolever et al¹⁷ refuted these conclusions by demonstrating that the observed glycaemic responses would be predicted by glycaemic indices of component foods. This study and others favour the latter observation¹⁸⁻²¹. Findings of this study indicate that baishn chapati is significantly better than wheat chapati, rice can be used as a carbohydrate staple food and glycaemic indices of individual foods may be used as a guideline for planning a diabetic meal.

ACKNOWLEDGEMENT

We are grateful to Dr. Sh. Mohammad Anwar, Assistant Professor Ophthalmology, Postgraduate Medical Institute, Lahore for his valuable suggestions, to Mr. Naeem Ahmed, Lecturer M.A.O. College for statistical assistance and to Mr. Muhammad Aslam for typing the manuscript. This study was sponsored by M/s. Hoechst (Pakistan) Ltd.

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