

Blood Glucose Level in response to carbohydrate meals with varying fibre content

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Summary :

Four males and five females were given a carbohydrate meal (stringhoppers) with different fibre content, prepared from polished and unpolished rice flour. Their blood glucose levels were estimated before and one hour after the intake of the meal. The mean blood glucose level increased from 74.7 mg dl⁻¹ to 94.6 mg dl⁻¹ and from 68.4 mg dl⁻¹ to 78.8 mg dl⁻¹ with the intake of stringhoppers prepared from polished and unpolished rice flour respectively. The increase in blood glucose level after the intake of the meal containing less fibre was significantly ($P < 0.05$) higher than that of the meal containing more fibre. In the same experiment it was also observed that the difference in the rise in blood glucose for polished rice between males and females was significant ($P < 0.01$) but not for the unpolished rice.

Introduction :

The importance of dietary fibre, the indigestible component of food, is becoming more and more pronounced today and it is considered as one of the essential nutrients. Though it has no caloric value, it is said that fibre protects the body from various, often fatal diseases including cancer of colon, coronary heart disease, diabetes mellitus and obesity. One of the important functions of fibre is that it controls carbohydrate absorption and thereby the insulin secretion. It also regulates the energy intake, reduces the serum cholesterol level and it is one of the major dietary factors which governs the function and the health of the large intestine. Jenkins et al.² had suggested that fibre has an insulin sparing effect which is probably due to the slow absorption of glucose when fibre is present in the intestinal lumen. In addition fibre ensures that the ingested carbohydrates reach mucosa more slowly and more distally.

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Natural foods like apples have been used to study the effect of fibre on ingested carbohydrates². Jenkins et al.² have given glucose with and without the addition of dietary fibre or fibre analogues to different groups of people and have found that the addi-

tion of fibres and fibre analogues had reduced the elevation in the blood glucose level. Further they have observed a reduction in serum insulin level when glucose was taken with fibres or fibre analogues. Habar et al³ have done similar experiments with diabetics and had found that the mean urinary glucose was reduced by 40–50% with the intake of dietary fibres.

This paper reports the work done to evaluate the effect of endogenous fibre of rice on the elevation of blood glucose level in normal individuals. Stringhopper prepared from polished and unpolished rice which is usually consumed with coconut gravy (T. Sothi) in Sri Lanka was taken as the model diet.

Methodology :

Preparation and administration of stringhoppers

Polished and unpolished raw rice were pound separately into flour. Polished rice contained 79% carbohydrate and trace of fibre and unpolished rice contained 75% carbohydrate and 1% fibre. Unpolished rice (600g) was used for the preparation of string-

hoppers for nine subjects and equal portions were given to them. An equivalent amount (450g) of carbohydrate contained in 570g of polished rice was used two days later to prepare stringhoppers and were given in equal portions to the same nine subjects. Four males and five females were selected for this experiment. On each occasion, 1.5 litres of coconut gravy (T. Sothi) from 12 table spoonfuls of Nestle coconut milk powder and condiments were made and divided into nine equal portions (167ml). Stringhoppers with coconut gravy formed the morning meal. The fasting blood sample was taken first before consumption of stringhoppers while the second blood sample was taken one hour after the meal.

Estimation of blood glucose

Blood glucose was estimated in duplicate on each blood sample by the method of Somogyi⁴.

Results and Discussion

Four males and five females were given carbohydrate meal (stringhoppers) prepared from polished and unpolished rice flour. The mean blood glucose level increased from 74.4 mg

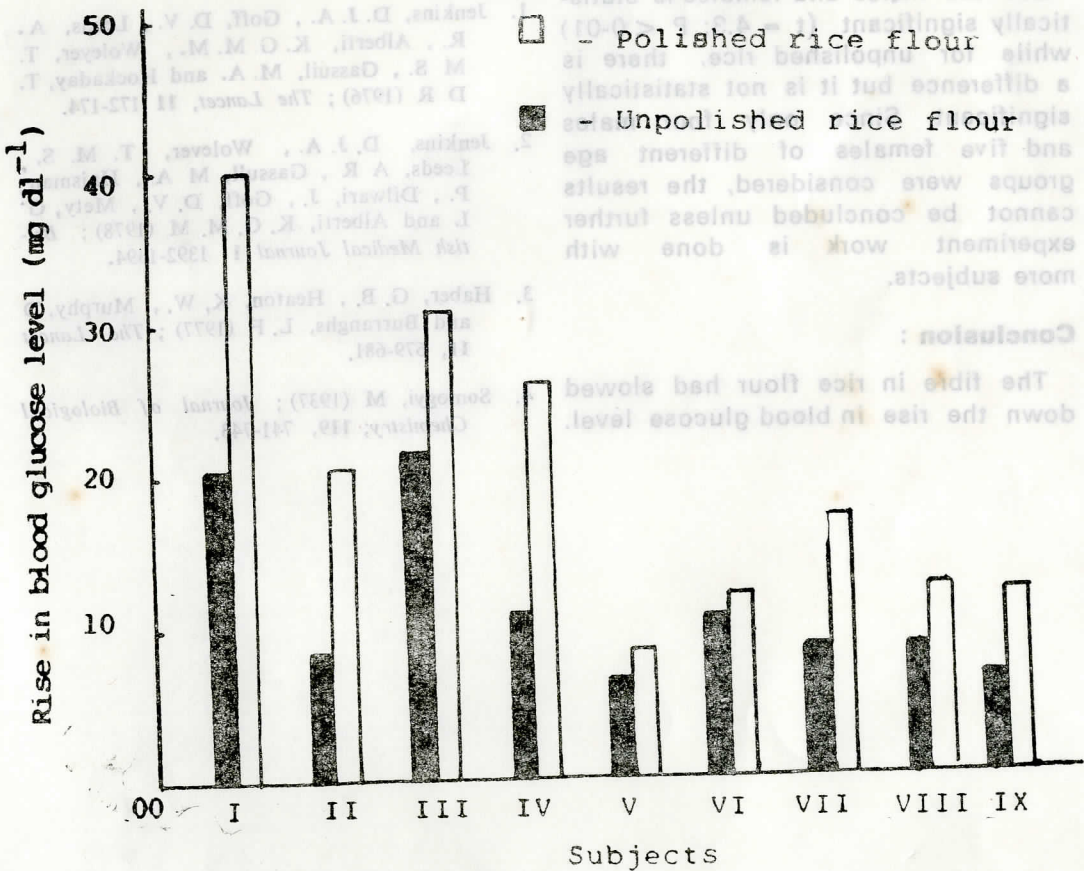
Table 1 : Mean blood glucose levels before and after the intake of stringhoppers from polished and unpolished rice flour.

Stringhoppers	Mean blood glucose level (mg dl ⁻¹)		
	Fasting	One hour after meal	Increase
Polished rice	74.4 ± 18.6	94.6 ± 21.1	19.9
Unpolished rice	68.4 ± 14.6	78.8 ± 21.07	11.4

dl⁻¹ to 94.6 mg dl⁻¹ and from 68.4 mg dl⁻¹ to 78.8 mg dl⁻¹ with the intake of stringhoppers prepared from polished and unpolished rice flour respectively. The mean rise in blood glucose level of the nine subjects one hour after the intake of stringhoppers made from polished and unpolished rice flour were 19.9 mg dl⁻¹ and 11.4 mg dl⁻¹ respectively (Table I). The difference in the rise in blood glucose levels was tested by the paired t test. The t value is 3.6 indicating that the difference is statistically

significant (P < 0.01). These results show good agreement with the work done by Jenkins et al,^{1&2}. The elevation in blood glucose levels is less in the subjects, when fed with stringhoppers made from unpolished rice flour. This decreased elevation in blood glucose may be due to the steric hindrance of amylase by fibres leading to a decreased rate of hydrolysis of starch and in addition the fibres blocking the released monosaccharides from reaching the mucosa for immediate absorption.

Figure 1 Rise in blood glucose levels in four males (I - IV) and in five females (V - IX) after the intake of stringhoppers.



The results of Haber et al.³ show that fibre which is in disrupted form has lesser effect than undisrupted fibre on the elevation of blood glucose level after a meal. Since in our experiments rice was pound to flour, the fibres would have been broken down and this disrupted fibres would have had less effect than the undisrupted fibres. This experiment could be repeated with rice in different forms (not flour) to illustrate better the effect of fibre on post prandial blood glucose levels.

This difference in the rise in the blood glucose for polished rice between the males and females is statistically significant ($t = 4.3$; $P < 0.01$) while for unpolished rice, there is a difference but it is not statistically significant. Since only four males and five females of different age groups were considered, the results cannot be concluded unless further experiment work is done with more subjects.

Conclusion :

The fibre in rice flour had slowed down the rise in blood glucose level.

This slow release of glucose into blood would help to spare the insulin and hence it may be advantageous to feed the mild diabetics with fibre containing diets to control the elevation of postprandial blood glucose.

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