DO DIFFERENT COOKING METHODS AFFECT GLYCAEMIC INDEX OF RICE?

M. D. T. L. Gunathilaka[1], and S. Ekanayake[1*]

[1]*Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka*

Introduction

Glycaemic index (GI) reflects the blood glucose response after a starchy meal. Many factors affect the GI including degree of starch gelatinization which depends on the amount of water added and the method of cooking. During cooking, heat and water soften the hard compact starch granules causing these to imbibe water, swell and eventually disrupt. As a result of that, individual amylose and amylopectin molecules are released leading to gelatinization. This makes starch more bioavailable for the action of enzymes causing increased glucose absorption. Rice is the staple food in Sri Lanka contributing to glycaemic carbohydrates and thus to the glycaemic response. Several studies had been conducted in the world, as well as in Sri Lanka to determine the GI of different rice varieties. Though it is believed that some basmati rice varieties imported to Sri Lanka have low GI, adequate research data on GI of these varieties is not available. Thus, the present study was conducted to evaluate the GI and the effect of two different cooking methods on GI of two imported basmati varieties (Pakistan basmati rice:-PBR; Indian basmati rice:-IBR) commonly purchased by Sri Lankans.

Materials and Methods

After following an unstructured interview type market survey, two basmati rice varieties were selected for the study IBR and PBR. GI of the two rice varieties was determined using the standard method. The GI study was designed as a randomized cross over study. Volunteers (n=10) were advised to undergo 8-10 hour fasting the day before each test day. A dietary recall of the previous night was taken from each volunteer on each test day due to secondary meal effect and the palatability and adequacy of portion size of two basmati rice varieties were recorded. About 200 µL of fasting blood sample was taken from the participants by finger prick using an Accu Check meter. Finger tips were wiped thoroughly with surgical spirit and disposable lancets were used to prick fingers.

Two basmati rice varieties were cooked separately in a rice cooker (Panasonic) and microwave (LG) by adding water (1 cup of rice (110 g): 1 cup of water (150 mL).

* sagarikae@hotmail.com

The test meal (IBR and PBR) containing an available 50 g carbohydrate portion (IBR:-147 g and PBR:-151 g) to be consumed within 10-15 minutes with 250 mL of water was provided. Further finger prick blood samples (as above) at 30, 45, 60, 90 and 120 minutes were obtained. Eppendorf tubes containing dried residues of NaF (10 µL) were used for blood collection. Blood glucose was analyzed using a glucose kit (GOD-PAP/BIOLABO–France). Likewise, test meal was given on two different days to the same participants by keeping a three day wash out periods.

Above procedure was followed with the standard. Glucolin (gsk Glaxco Wellcome Ceylon Ltd, Sri Lanka) that contained dextrose monohydrate was used as the standard food and 55 g corresponding to 50 g available carbohydrate was dissolved in 250 mL and given on two diffrent days to the same participants by keeping a three day wash out period. The following equation was used to calculate the Glycaemic Load (GL) of each individual and finally GL of a food was calculated as an average of ten values.

$$GL=\left[GI\times\frac{\text{weight of carbohydrate in one normal serving portion}}{100}\right]$$

The data was analyzed using the Statistical Package for Social Science (SPSS) Software (19th version) and Microsoft office Excel 2007. Chemical compositions are presented as mean ± SD and the GI values as mean ± SD. The results were analyzed using independent sample t-test by using SPSS (19th version) with 95 % taken as confidence interval.

Results and Discussion

The GI values of IBR cooked in the rice cooker (GI=54±8) or microwave (GI=43±6) belonged to low GI category (Table 1). These values are compatible with the values obtained from another study conducted by Srinivasa et al. (2013) who reported that the GI of an Indian basmati rice variety cooked in an electric cooker that belonged to low GI (54.93) category. The GI values of PBR cooked in rice cooker (GI=64±12) or microwave (GI=56±14) belonged to medium GI category (Table 1). Henry et al. (2005) studied commercially available four basmati in the UK and observed that the GI of all four basmati rice varieties belonged to medium GI (GI values- 52, 57, 67 and 69) category. Thus, present study results are compatible with the reported data for basmati rice varieties.

The GI values of the two rice varieties cooked using the rice cooker or microwave were not significantly different ($p<0.05$). However, there was a percentage reduction in GI values in PBR (12.5 %) and IBR (20.4 %) when cooked in a microwave oven compared to rice cooker method. GL is the product of the GI and the amount of available carbohydrate of the actual

portion size. Irrespective of the rice variety and the cooking method, all the rice portions provided a high GL.

Table 1. Glycaemic indices of PBR and IBR cooked in a rice cooker and a microwave (*n*=10)

	PBR cooked in a rice cooker	PBR cooked in a microwave	IBR cooked in a rice cooker	IBR cooked in a microwave
Mean GI (±SD)	64±12	56±14	54±8	43±6
Peaking time	45 minutes	30 minutes	30 minutes	30 minutes
% peak reduction (against glucose)	19%	20.4%	23%	24.3%
% reduction in GI compared to rice cooker	-	12.5%	-	20.4%
Glycaemic load	32	28	27	22

Conclusions and Recommendations

GI of PBR and IBR cooked in a rice cooker and microwave belonged to medium and low GI categories respectively. Microwave cooking reduces the GI.

References

FAO/WHO (Food and Agriculture Organization/World Health Organization). (1998). *Carbohydrates in Human Nutrition*. Report of a Joint FAO/WHO expert consultation. FAO Food and Nutrition Paper - 66, Rome.

Henry CJK, Helen JL, Caroline MS, Hamish R, Simon H (2005) Glycaemic index and glycaemic load values of commercially available products in the UK. *British Journal of Nutrition* 94: 922–930.

Srinivasa D, Raman A, Meena P, Chitale G, Marwaha A, Jainani KJ (2013) Glycaemic Index (GI) of an Indian branded thermally treated basmati rice variety: A multi centric study. *Journal of the Association of Physicians of India* 61: 32-36.

Wolever TM, Jenkins DJ, Ocana AM, Rao VA, Collier GR (1998) Second meal effect: low-glyceamic-index foods eaten at diner improve subsequent breakfast glyceamic response. *American Journal of Clinical Nutrition* 48: 1041-1077.

Wolever TM, Vorster HH, Björck I, Brand-Miller J, Brighenti F, Mann JI, Ramdath DD, Granfeldt Y, Holt S, Perry TL, Venter C, Xiaomei Wu (2003) Determination of the glycaemic index of foods: inter-laboratory study. *European Journal of Clinical Nutrition* 57: 475-482.

Wordu GO, Banigo EB (2013) Evaluation of the glycaemic index of some cooked variety of rice products in Nigeria. *Net Journal of Agricultural Science* 1:38-41.