

Preliminary Study on the Modulatory Role of Honey on Blood Glucose Levels in Non-Diabetic Wistar Albino Rats

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Abstract: This study was undertaken to evaluate the modulatory role of honey administration on blood glucose levels in non-diabetic Wistar rats within time intervals. Animals were randomly divided into four groups (n = 5): Rats in group I were given 1mL of distilled water and served as the control. Rats in group II, group III and IV, were administered 50, 100, 200 mg/kg body weight of honey respectively. After administration blood samples were collected from the tail artery of the rats at interval of 1, 4, 8 and 16 h, respectively. The study showed that there was no significant change ($p>0.05$) on levels of blood glucose levels in the groups administered with 50, 100 and 200 mg/kg b w of honey when compared to control group. The findings from the present study showed that honey has a mild effect on glycaemic response and therefore, may be recommended as a source of carbohydrate and even sweetening agent in place of sugar to diabetic patients.

Key words: Blood glucose rats, diabetes mellitus, glycaemic response, honey

INTRODUCTION

Honey is a popular sweetener and a common household product used throughout the world. For a long time in human history it was an important carbohydrate source and the only largely available sweetener until industrial sugar production began to replace it after 1800 Crane (1975). In the long human tradition honey has been used not only as a nutrient but also as a medicine (Jones, 2001). An alternative medicine branch, called apitherapy, has developed in recent years, offering treatments based on honey and the other bee products against many diseases. The impact of carbohydrates on human health is controversial, especially the understanding of how the carbohydrates of a given food affect the blood glucose level. Today, the dietary significance of carbohydrates is often indicated in terms of the Glycemic Index (GI). Carbohydrates with a low GI induce a small increase of glucose in blood, while those with a high GI induce a high blood glucose level. The only comprehensive data on honey GI are based mainly on data of different Australian honeys (Foster-Powell *et al.*, 2002; Arcot and Brand-Miller, 2005). Due to the variation of botanical origin honey differs in appearance, sensory perception and composition. Honey consists of 40% each of glucose and fructose. The glucose portion is quickly absorbed into the blood stream while the fructose portion must be changed first into glycogen and then into dextrose. This particular characteristic of honey had led to the speculation whether

honey can be used as a substitute for sugar. The main objective of this study is to investigate the effect of honey, water, on blood glucose levels within time intervals in non-diabetic animals.

MATERIALS AND METHODS

Preparation of honey: Honey was procured from Minna central market Niger state, Nigeria, with a water content of 18% (using a refractometer). Two grams of honey was diluted with 10 mL distill water to obtain a concentration of 200 mg/kg. Honey was freshly diluted with distilled water just before each administration.

Experimental animals: Wistar strain albino rats of both sexes between 110-280 g, which were bred in the Department of Pharmacology A.B.U., Zaria and were maintained in a temperature and humidity-controlled room with a 12-h light/dark cycle with free access to standard diet and water. All the animals were fasted for 12 h, before commencement of the experiments.

Experimental protocol: The animals were randomly divided into five groups of honey treated groups and the control groups as follows:

Group 1: Received distilled water.

Group 2: Received 50 mg/kg body weight of honey.

Group 3: Received 100 mg/kg body weight of honey extract.

Table 1: Effect of honey on blood glucose levels in non-diabetic wistar albino rats

Treatment (N = 5)	Blood glucose level (mg/dL) Mean±SEM			
	1 h	4 h	8 h	16 h
Distilled water	85.6±5.8	82.6±8.1	84.8±3.3	82.8±6.7
Honey (50 mg/kg)	81.8±7.7 ^{ns}	85.8±8.1 ^{ns}	113.4±10.0 ^{ns}	91.4±8.5 ^{ns}
Honey (100 mg/kg)	82.8±3.2 ^{ns}	112.2±19.2	124.8±15.6	110.8±4.0
Honey (200 mg/kg)	127.6±21.5 ^{ns}	85.2±11.2 ^{ns}	110.8±4.0 ^{ns}	100.2±12.1 ^{ns}

Values are presented as mean±SEM; Values are statistically significant compared to control group at ^ap<0.05; ns: not significant

Group 4: Received 200 mg/kg body weight of honey extract.

Fasting blood glucose level was taken for all the groups, before and after the oral administration of honey preparation.

Determination of blood glucose level: All blood samples were collected from the tail artery of the rats at intervals of 1, 4, 8 and 16 h, respectively after taking the fasting glucose level. Determination of the blood levels was done by the glucose-oxidase method (Beach and Turner, 1958) using a digital glucometer (Accu-Chek Advantage, Roche Diagnostic, Germany) and the results were expressed in the unit of mg/dL (Rheney and Kirk, 2000).

Statistical analysis: Blood glucose levels were expressed in mg/dL as mean±SEM. The data was analyzed using ANOVA with multiple comparisons versus control group. The values of p≤0.05 were taken to be significant.

RESULTS

The results of the effect of honey on blood glucose levels in non-diabetic rats within time intervals is presented in Table 1. Results obtained from this study revealed no statistically significant difference (p>0.05) on blood glucose levels on the groups administered with various doses of honey, 50, 100 and 200 mg/kg body weight, respectively when compared to control group.

DISCUSSION

The results demonstrated that honey gradually increases blood glucose levels after ingestion but not significantly this agrees with the study of Akhtar and Khan (1989), who observed that, oral administration of honey at a dose of 5 mL/kg produced no significant increase in blood glucose levels in normal rabbits. Another study by Chambaugh and Worthington (1990) also recorded, that honey had lower glycaemic response than the same quantity of fructose or sucrose. This could be because there is a significant negative correlation between fructose content of honey and glycaemic index (Stefan *et al.*, 2008), probably due to the different fructose/glucose ratios of the honey types tested. Honey

compared with dextrose caused a significantly lower rise in plasma glucose levels in diabetic subjects. It also caused reduction of blood lipids, homocysteine levels and CRP (C reactive protein) levels in normal and hyperlipidemic subjects (Al-waili, 2004).

Fructose does not require insulin for its initial metabolism and in non-diabetics the blood glucose response curves following ingestion of fructose, sucrose, glucose and starch differ significantly.

The consumption of honey types with a low GI, might have beneficial physiological effects and could be used by type-2 diabetes patients. An intake of 50 g honey of unspecified type by healthy people and diabetes patients led to smaller increases of blood insulin and glucose than the consumption of the same amounts of glucose or of a sugar mixture resembling to honey (Jawad *et al.*, 1981).

It was shown that consumption of honey has a favourable effect on diabetes patients, causing a significant decrease of plasma glucose (Al-waili, 2003, 2004). This further substantiates the evidence that honey has gentler effect on glycaemic response, therefore appropriate for glycaemic control and may be recommended as a source of carbohydrate and even sweetening agent in place of sugar to humans and patients suffering from diabetes mellitus.

ACKNOWLEDGMENT

The authors of this work wish to acknowledge the technical assistance of Mallam Bala Mohammed and MallamYa'u Bello of the Department of Physiology Ahmadu Bello University, Zaria, Nigeria.

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