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Research Article

**AN EXPERIMENTAL RESEARCH ON THREE VARIOUS  
GROUPS OF HONEY AND GLUCOSE INTAKE FOR THE  
GLYCEMIC RESPONSE COMPARISON IN THE TYPE 2  
DIABETES (T2DM) PATIENTS IN ORDER TO MEASURE  
AFTER INGESTION LEVEL OF BLOOD GLUCOSE**<sup>1</sup>Dr. Abdullah Zaka, <sup>2</sup>Dr. Asif Iqbal, <sup>3</sup>Dr. Saba Javaid<sup>1</sup>Ameer-ud-din Medical College Lahore<sup>2</sup>Medical Officer, BHU Jandraka, Hafizabad<sup>3</sup>Medical Officer BHU 366 GB Faisalabad**Abstract:**

**Objective:** Our research was aimed at the comparison of the glyceemic effect (75 grams) and natural honey (30 grams) in a test of honey tolerance with the glucose (75 grams) in the patients of T2DM (type 2 diabetics).

**Methods:** The research design was experimental which was carried out in the setting of Mayo Hospital, Lahore on a total of ninety-seven T2DB patients selected through OPD department in the time frame of April – September, 2017. We divided the sample population on random basis into three groups respectively Group I, II and III having Honey (75 grams), Honey (30 grams) and Glucose (75 grams). The patients were screened for the fasting samples of blood in the time interval of one and two hours. Data was analyses on the SPSS.

**Results:** In the total research population females and males were respectively 62 females (64%) and 35 males (36%) in the age range of (25 – 68) years. An average mean blood glucose rise at the interval of two hours was observed as (30 mg/dl) in group – I; 85 mg/dl in group - II and 170 mg/dl in group – III with a significant p-value of (< 0.005). We observed a significantly low glucose response after two hours with a significant p-value of (< 0.001) in comparison to Group I & II. There was a significant variation in the group I & III with a significant p-value of (< 0.0001). The response of the level of plasma glucose against honey was observed as at peak level at sixty minutes and which reflected a rapid decline in comparison to the glucose, which shows a lower honey glyceemic response. Glucose lowering affect was also observed in three cases (10.7%) when they were given a low honey dose.

**Conclusion:** Our research concludes that honey (low dose) is potently valuable substitute in the place of sugar for the diabetic patients.

**Keywords:** Type 2 diabetes mellitus (T2DM), Honey, Glucose tolerance test, Fructose and Insulin.

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**INTRODUCTION:**

Honey is found in the history (3000 BC) Chinese and Egyptians used it to cure the illnesses and it was also considered as god's food by Greeks. Even the Holy Quran favors the use of honey and for its healing characteristics [1]. It is a natural sweetener which is also purely natural. Bees use multiple flowers including some of the medicinal plants (Red Clover) in order to collect nectar for the production of honey. Bees actually use and shift the medicinal effects of the various plants in to honey. Whereas, sugar is a combination of (99% sucrose) gained through sugarcane and valuable nutrients are destroyed in this process of making sugar such as enzymes, organic acids and proteins [2]. It makes honey as the best healer and natural sweetener.

We used in our research the honey made of Clover. This honey is actually a solution of various sugars which include (38%) fructose, (32%) glucose, (2%) sucrose, (7%) maltose numerous other acids, sugars and flavoring compounds about (4%) [3].

Honey has hyperglycemic effect as it is a combination of various sugars. However, the research studies held on the models of human and animals diagnosed with diabetes (Type – I) type and impaired tolerance of insulin also show hypoglycemic effects of honey [4, 5, 6]. However, precise hypoglycemic mechanisms effect also remains unknown. In the same way few of the research studies held on the patients of T2DM were scarce in Pakistan. Our research was aimed at the comparison of the glycemic effect (75 grams) and natural honey (30 grams) in a test of honey tolerance with the glucose (75 grams) in the patients of T2DM (type 2 diabetics).

**PATIENTS AND METHODS:**

The research design was experimental which was carried out in the setting of Mayo Hospital, Lahore on a total of ninety-seven T2DB patients selected through OPD department in the time frame of April – September, 2017. All the cases diagnosed with pregnancy, renal impairment, steroids users and smokers were not made a part of the research. We selected only those cases which were adult, eighteen years old and diagnosed with T2DM with a fasting plasma glucose rate above (200mg/dl).

Ethical approval was taken from the hospital and also secured informed consent of the participants. We used “SUE BEE Honey” made of Clover flowers which was hundred percent pure [3]. Patients were divided in three groups after an overnight fasting. Group – I had 39 natural honey (75 grams) cases (40%), Group – II had 28 cases of pure (30 grams) natural honey (29%) and in the Group – III had 30 cases of (75 grams) glucose (31%). Water (250 mls) was mixed in the glucose and honey before administration.

We also screened the samples of blood at the interval of 0 – hour with a status of fasting after the one and two hours interval was observed as digestion was complete. All the cases of levels of plasma glucose levels above (250mg/dl) at the interval of two hours were monitored for twelve hours period, no complicated cases were reported in this process.

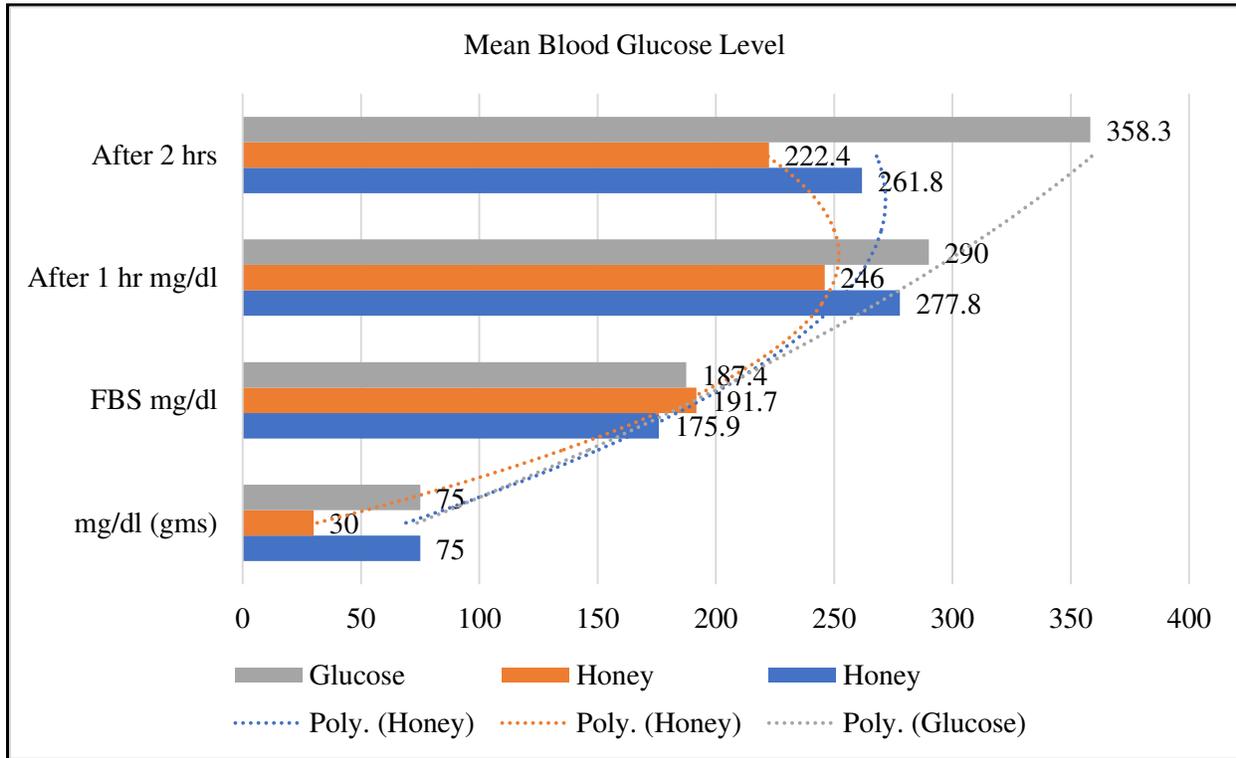
Analysis of the data was carried out on SPSS, we also calculated every group for descriptive values. ANOVA one-way analysis was also used to compare the mean in various groups. Through Tukey Post-hoc test multiple comparisons were made in this research.

**RESULTS:**

In the total research population females and males were respectively 62 females (64%) and 35 males (36%) in the age range of (25 – 68) years. An average mean blood glucose rise at the interval of two hours was observed as (30 mg/dl) in group – I; 85 mg/dl in group - II and 170 mg/dl in group – III with a significant p-value of ( $< 0.005$ ). We observed a significantly low glucose response after two hours with a significant p-value of ( $< 0.001$ ) in comparison to Group I & II. There was a significant variation in the group I & III with a significant p-value of ( $< 0.0001$ ). The response of the level of plasma glucose against honey was observed as at peak level at sixty minutes and which reflected a rapid decline in comparison to the glucose, which shows a lower honey glycemic response. Glucose lowering affect was also observed in three cases (10.7%) when they were given a low honey dose. Mean age factor was observed as ( $5.3 \pm 4.9$ ) years. Diet control was observed in 6 cases (6.2%), 65 cases of oral intake of hypoglycemic agents (67%), 26 cases of insulin combined with Thiazolidinediones (TZDs) and metformin (26.8%). The level of fasting glucose was observed as shown in Table – I.

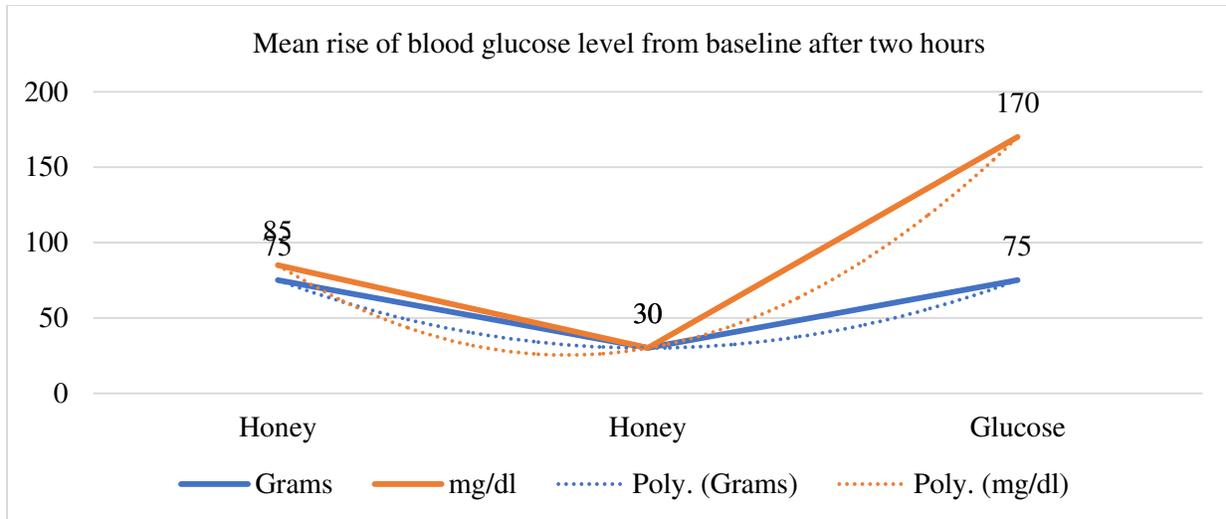
**Table – I:** Mean Blood Glucose Level at Fasting and after Ingestion of Glucose or honey

Honey/Glucose	mg/dl (grams)	FBS mg/dl	After One-hour mg/dl	After Two hours
Honey	75	175.9	277.8	261.8
Honey	30	191.7	246	222.4
Glucose	75	187.4	290	358.3



**Table – II:** Mean rise of blood glucose level from baseline after two hours

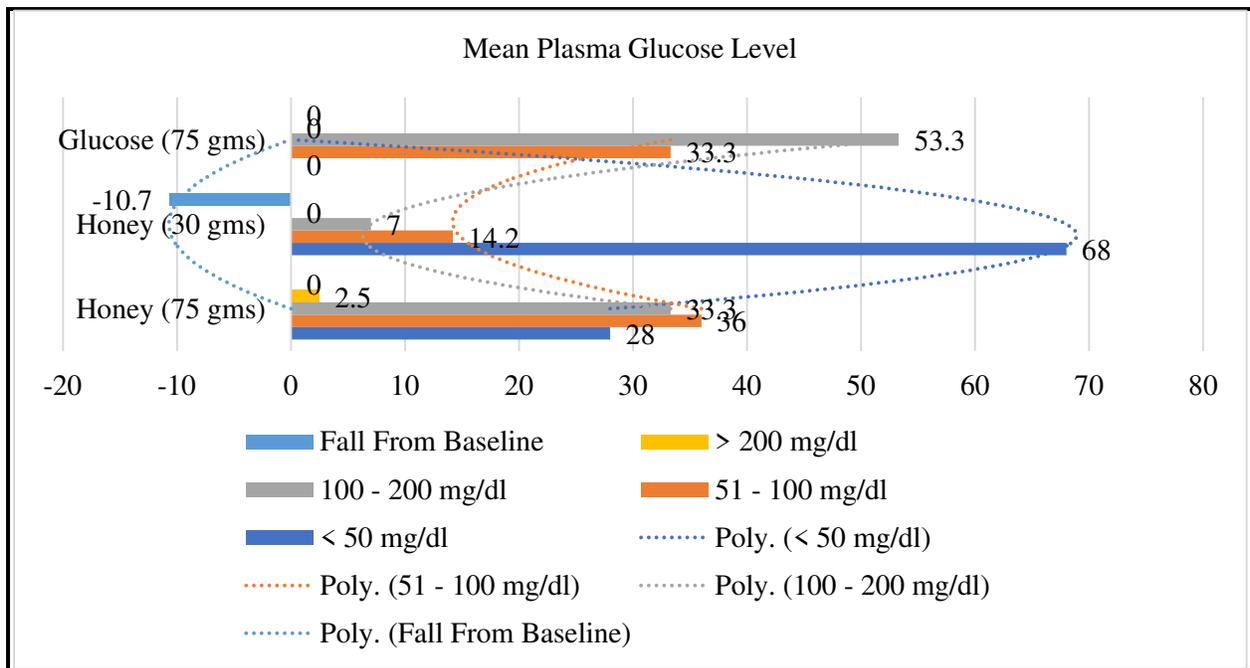
Honey/Glucose	Grams	mg/dl
Honey	75	85
Honey	30	30
Glucose	75	170



In the Group I & III comparison, 5 cases in G – III had above (200 mg/dl) (13.3%) rise over the baseline when compared to the level of G – I observed in one case (2.5%). Group – II was observed with a rise of below (50 mg/dl) in 19 cases (68%); whereas no case was observed (>200 mg/dl). It was surprising to note that 3 cases were of blood sugar (10.7%) at an interval of 2 hours observed under the level of fasting as shown in Table – II.

**Table – III:** Percentage of patients with the amount of rise in blood glucose above baseline at two hours

mg/dl	Honey (75 grams)	Honey (30 grams)	Glucose (75 grams)
< 50 mg/dl	28	68	0
51 - 100 mg/dl	36	14.2	33.3
100 - 200 mg/dl	33.3	7	53.3
> 200 mg/dl	2.5	0	0
Fall from Baseline	0	-10.7	0



**DISCUSSION:**

This research was aimed at the comparison of the glycemic response to high and low honey dose and glucose in the cases of diabetes. We observed a significant low level of rise in the one hour and three hours interval in the group of natural honey (75 grams) with the solution of glucose, which is same as the research carried out on the healthy individuals with an intake of artificial or natural honey or glucose reflecting a low levels of plasma glucose rise in the group of natural honey users [7]. It is revealed in another research which was carried out on the healthy cases of honey users that serum glucose is less effected than the solution of honey, glucose-fructose [8]. At the interval of two hours after the ingesting of 75 and 30 grams honey, the mean level of the blood glucose was observed lower than in comparison to the first hour of ingestion, but the reason behind this phenomenon is still not known. Deibert et al. states that honey effects may depend on the honey fructose content [9]. As we used a brand of honey known as "Clover Honey", which had (38%) fructose in comparison to the glucose content level observed as (32%) [3]. We need to ascertain the appropriate mechanism of lowering of fructose. However, it is revealed in an article of review that numerous mechanisms comprised of the enhancement of the hepatic glucose uptake through glucokinase activation and promotes glycogen storage and synthesis by glycogen synthase activation in liver, there is another mechanism that fructose and glucose might exert a synergistic effect in pancreas and intestine.

This process may increase the absorption of the intestinal fructose in intestine and may stimulate the secretion of insulin in pancreas. Glycemic control may be improved by fructose which is independent on the insulinotropic effect [10]. There are various other proposed mechanisms, it is suggested in a research that less effect has been caused by honey on insulin serum and in the levels of C-peptide in healthy and normal subjects [8]. A research also forwards that a low rise in the level of blood glucose was observed after the intake of royal jelly, which suggests that substances originating from honey bee's pharyngeal glands having an activity like insulin may or may not cause this effect, it is partially responsible for honey impact lowering on levels of blood glucose [11]. It is also concluded in a research about the contribution of the glucotoxicity to dysfunction of beta-cell by oxidative stress; whereas, hypoglycemic effect of honey can be associated with the anti-oxidative effect on pancreas [9]. Further strength is given to this effect as honey is capable of lowering prostaglandins concentrations in normal individual's

plasma [12]. We cannot ascertain the true mechanism which is functioning in the patients of T2DM because scarce literature is available in this regard. The already built concepts of previous two decades have been changed as an added sugar (sucrose) is to avoided in the diet of diabetes [13]. In the result of a fear of hyperglycemia stimulation sugar added diet is restricted in the diabetic patients [13]. We observed in our research that 68% cases of T2DM had a rise blood sugar above (50 gm/dl) after low dose honey ingestion, it suggests that the cases of T2DM as a dull glycemic response may help in the reduction for the intolerance of the glucose [15]. We did not aim at the long-term benefits of the utilization of honey by the diabetic patients.

**CONCLUSION**

Our research concludes that honey (low dose) is potentially valuable substitute in the place of sugar for the diabetic patients. Substance identification in the honey is responsible for the lowering of the glucose effect that may also develop new adjunct treatments for diabetic patients.

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