

EFFECT OF DIET PEPSI ON TYPE 2 DIABETIC PATIENTS +

تأثير البيبسي المنظم على مرضى السكري من النوع الثاني

Huda Abdul Hameed Jassim *
Suad Yunis Ali *

Nizar Showky Al-Safar **
Feras Younis Mohsen **

Abstract:

It is clear that diabetic patients need artificial sweeteners in their food and drinks in order not to increase their plasma glucose level while still enjoying the same taste in their food as the ordinary sugar.

The aim of this study is to investigate the effect of diet Pepsi, which is available in the local market on the glycaemic index of type 2 diabetic patients.

The data for this cross sectional study were collected from 33 diabetic patients (the age range for whole sample was 33-77 years, male:19, female:14) who were attending to the National Diabetes Center in Al-Mustansiriya University. All patients were having type 2 diabetes and were treated with oral hypoglycemic agents or diet alone. Each patient included in this study was in a fasting state (over night fasting), and had not received any medication before the interview. After fasting plasma glucose was measured for every patient, the patients were asked to drink 330 cc of diet Pepsi drink and the plasma glucose level was measured after two hours (postprandial) from drinking that diet Pepsi meal.

The results obtained from this study, indicate clearly a significant difference between the means of fasting and the postprandial plasma glucose (202 ± 88), (184 ± 75) mg/dl respectively, it was lower for the postprandial plasma glucose ($P < 0.00001$), also the result obtained showed a significant difference among means of fasting plasma glucose and postprandial plasma glucose for male, and female patients, it was higher in female patients ($P = 0.05$). The decrement in the mean of the level of plasma glucose after taking diet Pepsi was of significant statistical value, which indicates that this product is really sweetened by synthetic sweeteners and has no negative effect on plasma glucose level for the patients who were included in this study.

Key words : Diabetic ,diet Pepsi

المستخلص:

ان المرضى المصابين بداء السكري يواجهون صعوبات في تنظيم نسبة السكر في البلازما وعن طريق تحديد تناولهم لمادة السكر واستبدالها بالمحليات الصناعية وبذلك يمكنهم تناول أغذية مختلفة وفي نفس الوقت الحفاظ على مستوى الكلوكوز في البلازما.

⁺Received on 3/10/2010 , Accepted on 1^v/9/2011 .

* Ass . Prof . / Medical Technical Institute-Baghdad

** LECTURER / National Diabetes Center/ Al-Mustansiriya University

وكان الهدف من هذه الدراسة هو التحري عن تأثير المشروبات الغازية المحلات صناعياً والمتوفرة في الاسواق العراقية على مستوى الكلوكوز في البلازما عند المرضى المصابين بداء السكري (النوع الثاني). أما نوع الدراسة فكانت دراسة مقطعية شملت ٣٣ مريضاً مصاباً بداء السكري (النوع الثاني) (تتراوح أعمارهم بين ٣٣ - ٧٧ سنة ،ذكور: ١٩ ،إناث : ١٤) من المرضى الذين يراجعون المركز الوطني لعلاج وبحوث السكري (الجامعة المستنصرية).

اجري لقاء مع كل مريض على انفراد وشرحت له أهداف البحث وبعد موافقته على الدخول كعينة أجري له فحص مستوى الكلوكوز في البلازما بعد الصيام ومن ثم يتناول قنينة بيبسي (المنظم) تحوي ٣٣٠ سي سي وبعد ساعتين أجري له فحص السكر مرة ثانية .

كان هناك فرقاً ذو دلالة احصائية بين مستوى الكلوكوز في البلازما أثناء الصيام وبعد ساعتين من تناول البيبسي (المنظم) حيث كانت نسبة الكلوكوز في البلازما أثناء الصيام أعلى من مستوى الكلوكوز في البلازما بعد تناول البيبسي (المنظم) وكما أظهرت النتائج أن مستوى الكلوكوز في البلازما أثناء الصيام وبعد ساعتين من تناول البيبسي (المنظم) لدى المرضى الإناث أعلى من مستوى الكلوكوز في البلازما لدى المرضى الذكور أثناء الصيام وبعد ساعتين من تناول البيبسي (المنظم) .

كانت نسبة الهبوط في معدل مستوى الكلوكوز في البلازما بعد تناول مادة البيبسي (المنظم) بفرق ذو دلالة احصائية مهمة وذلك يشير على ان هذه المادة هي فعلاً محلاة بمواد صناعية ليس لها تأثيراً سلبياً على مستوى الكلوكوز لدى المرضى المصابين بداء السكري ممن ادخل في هذا البحث .

Introduction:

Diabetes mellitus is a chronic disease that occurs when the pancreas does not produce enough insulin, or alternatively, when the body cannot effectively use the insulin it produces(Insulin is a hormone that regulates blood glucose) [1] People with diabetes have difficulty regulating their blood glucose levels, by limiting their sugar intake with artificial sweeteners they can enjoyed a varied diet while closely controlling their sugar intake, also some sugar substitutes do release energy but are metabolized more slowly allowing blood glucose levels to remain more stable over time [2]

The US Food and Drug. Administration (FDA) regulates artificial sweeteners as food additives Food additives must be approved by the FDA, up to date the FDA has not been presented with scientific information that would support a change in conclusions about the safety of the six approved high-intensity sweeteners. The safe conclusions are based on a detailed review of a large body of information, including hundreds of toxicological and clinical studies [3][4]

The majority of sugar substitutes approved for food use are artificially-synthesized compounds; Aspartame is currently the most popular sweetener in the U.S. food industry [5]

Acesulfame [potassium](#), also known as Acesulfame K, is an artificial sweetener. It was first discovered in 1967.

It has a wide variety of applications, and is widely used in food and drinks both in the United States and Europe, and it has been approved by the United States Food and Drug Administration (USFDA), and equivalent organizations in Europe [6] study tried to investigate the effect of diet Pepsi which is available in local markets on glycemic index of type 2 diabetic patients.

Patients and methods:

The data for this study were collected from 33(the age range for whole sample was 33-77 years ,male:19,female:14) diabetic patients who were attending the National Diabetic Center in Al-Mustansiriya University.

All patients were having type 2 diabetes and treated with oral hypoglycemic agents or were on - diet alone and every patient with type 1 diabetes or was treated by insulin was excluded from this study.

Collection of data was carried out during the period between 1/2/2010 and 23/2/2010, the data were collected using interviewing questionnaire, measurements and investigations, and systematic postprandial sampling technique was used for selection of the samples.

Daily selection of the first patient was done postprandial subsequently patient were selected every third patient ,each patient that meets the inclusion criteria was interviewed, and the aim of the study was explained to the patients.

In the interview the patients were asked to answer the following questions (age, family history of diabetes, type of the treatment, age of onset of diabetes, and duration of the diabetes).

The anthropometric measurements used in this research included weight and height, the body mass index (BMI) was calculated according to the formula ...BMI = weight in kg / height in square meter ,each patient included in this study was in fasting state (over night fasting), and had not received any medication during the fasting period ; before the interview then the fasting plasma glucose were taken for every patient, then the patient were asked to drink 330 cc of diet Pepsi drink and the plasma glucose level was measured after two hours from drinking that diet Pepsi.

Results:

Table (1) personal characteristics of study group

Characteristic	N=33
Age	53.30±10.46
BMI	30.7±4.9
WHR	0.91±0.04
Age of onset of DM	7.5±7.4

The age range for whole sample was 33- 77 years (mean 53.30 ± 10.46) .Out of the 33 diabetic patients who represent the whole sample 14 (42.4%) of them were females and 19(57.6 %) were males, the means of the BMI,weast hip ratio(WHR) and age of onset of the diabetes were (30.7 ±4.9), (0.91±0.04),(7.5±7.4) respectively , as shown in table (1-2)

Table (2) the distribution of subjects according to gender, family history and type of treatment

variable	Total sample	
	No.	%
Gender		
Male	19	57.6
Female	14	42.4

Family history		
Positive	18	54.5
Negative	15	45.5
Type of treatment		
Oral	28	84.8
Diet	5	15.2

Out of the patient, 18(54.5%) have positive family history were as 15 patients(45.5 %) have no family history of diabetes; 28 patients (84.8%) were treated by oral hypoglycemic agents and the remaining 5 patients (15.2%) treated by diet restrictions alone . As shown in this table.

Table (3) paired t-test for blood glucose (fasting and 2hour post receiving diet cola)

FBG gm/dl	RBG after 2 hours	t.df.p
202±88	184±75	4.13;31;0.00001

The means of fasting and random blood glucose were (202 ± 88) (184±75)mg/dl respectively; there was a significant difference between the two means, it was lower for the random blood glucose ($p < 0.00001$) as shown in this table.

Table (4) blood glucose (fasting and two hours post cola drink for male and female patients)

Blood glucose	Gender		t.df.p
	male	female	
Fasting	166±44	251±110	3.01;31;0.05
Two hour post cola diet	153±87	226±87	3.05;31;0.05

The means of fasting blood glucose for males and females were (166 ±44), (251 ±110) respectively, and the postprandial plasma glucose for the male and female patients were (153±87), (226±87) respectively, there was a significant difference among means of fasting blood glucose and random blood glucose for male and female patients , it was higher in female patients ($p = 0.05$), as shown in this table.

Table (5) paired t test for fasting blood glucose and random blood glucose in male and female patients.

Gender	Fasting glucose	blood	Random glucose	blood	t. d f. p.
Male N=(19)	166±44		153±87		3.6;18;0.0021
Female N=(14)	251±110		226±87		2.5;13;0,026

In male patients, the 2 hour postprandial plasma glucose(2 hours after taking the diet pepsi) was lower than the fasting plasma glucose (highly significant difference, between the two means $p = 0.0021$).

While in female patients the difference between means of fasting plasma glucose and the two hours postprandial plasma glucose was significant ($p = 0.026$) .

Though the difference in the female patient was significant but it was less than male difference which was highly significant as shown by the p value, as shown in this table.

Table (6) comparison between means of body mass index of males and females participants

Gender	BMI	t.df.p
Male	28.27±2.7	3.7:31:0.00001
Female	33.84±5.4	

This table showed the means of body mass index (BMI) for males and females patients were (28.27±2.7) (33.84±5.4) respectively, it is significantly higher in females patients (p<0.00001).

Table (7) comparison of FBG and RBG in relation to type of treatment (oral hypoglycemic agents and diet alone)

Type of TR	Diet N(5)	Oral hypoglycemic agent N(28)	t.df.p
FBG	204±122	202±84	0.059:31:0.954
RBG	182±93	185±74	0.80:31;0.937

This table showed the fasting and postprandial plasma glucose in patients treated with oral hypoglycemic agents shows no significant difference in comparison to fasting and postprandial plasma glucose in patient treated by diet restriction only.

Discussion:

It is well known how high caloric sugar sweetened soft drinks effect diabetes in the term of making the glycemic control worse and in the term of adding more weight to the patients on the long run . While all type 2 diabetic patients who were obese, well informed to decrease weight in order to decrease insulin resistant and hence make better glycemic control.

An 8-year study of 50,000 female nurses compared with women who increased drinking from almost no soft drinks to drinking more than once a day to women who decreases from drinking more than one soft drink a day to drinking almost no soft drinks. The women who increased their consumption of soft drinks gained 8.0 kg over the course of the study while women who decreased their consumption gained only 2.8 kg. In each of these studies, the absolute number of soft drinks consumed per day was also positively associated with weight gain [7]

The consumption of sugar-sweetened soft drinks is also associated with many weight-related diseases, including diabetes metabolic syndrome and cardiovascular risk factors, and elevated blood pressure [8] [9]

Sugar-sweetened drinks also cause weight gain in adults. In a study, overweight individuals consumed a daily supplement of sucrose-sweetened or artificially sweetened drinks or foods for a 10 week period. Most of the supplement was in form of soft drinks. Individuals in the sucrose group gained 1.6 kg, and individuals in the artificial-sweetener group lost 1.0 kg. [10] [11]

The introduction of diet soft drinks which contain zero calories, (as FDA guidelines allow products with fewer than five calories per serving to be labeled as containing zero calorie); are supposed to no effect on the glycemic control nor increase body

weight. Since they contain no sugar and are sweetened by artificial sweeteners like aspartame (124 mg/355 ml) ,and acesulfame potassium (32 mg/355 ml) .In this study a 33 patients were given 330 cc of artificially sweetened soft drinks after 8 hours fasting, their fasting plasma glucose were recorded first then their postprandial plasma glucose was recorded after 2 hour of taking the soft drink.The postprandial plasma glucose did not increase after taking the soft drinks, in fact all patients showed decrease in their postprandial plasma glucose in comparison to the fasting plasma glucose which was taken before they drank the soft drinks that we gave.Yet the difference between the fasting and postprandial readings showed more significance decrement in males rather than females.The decrement in postprandial reading after taking the artificial sweetened soft drink in all patients give us a clue that those drinks are really zero calorie and contain no sugar.The decrement in the blood glucose was more in males than females, this result could be due to the fact that all the fasting readings of females were higher than the fasting readings of males , which means that the plasma glucose in the fasting state of male samples of this study was better controlled than that of females.The difference might be attributed to the fact that female patients have higher body mass index than that of male patients . All the patients showed decrement in their plasma glucose after taking the diet Pepsi, and this include the patients who were on diet treatment only, and those who were on oral hypoglycemic agents, there was no significant difference between the means of the plasma glucose decrement on both types of patients, this gives a clue that there was no effect of the oral hypoglycemic agent taken the day before the test on the decrement of plasma glucose at the time when the test was applied.

Conclusion:

The decrement in the mean of level of plasma glucose after taking diet pepsi was of significant statistical value , which indicates that this product is really sweetened by synthetic sweeteners and has no negative effect on plasma glucose level for the patient who were included in this study.

References:

- 1.Mokdad AH. And other , "Diabetes trends in the US" Diabetes care,vol. 23, pp.1278 – 1283 , 1990-1998.
- 2.Wing RR and others, "Effect of a very low calorie diet on long _term glycemic control in obese type 2 diabetic subjects" Archives of internal medicine ,vol. 151, pp. 1334 – 49, 1991.
- 3.FDA, " No calories sweet" Available at http://www.fda.gov/features/406_sweetners.html, 2006.
- 4.US FDA "Website Guidance Documents" Available at <http://www.cfsan.fda.gov/~dms/grasguid.html# Q1>, 2006.
- 5.FDA,"s response to European Aspartam Study" (htt://fda.gov/bbs/topics/News/New01369.html) ,2006 .
- 6.Cloauss.K. and others," Oxathiazinone Dioxides- A New Group of Sweetening Agents" Angewan dte Chemie, International Edition vol.12, No.1,pp.869-867, 1973.
- 7.Schulze M.B, and others,"Sugar sweetened beverages wieght gain and incidence of type 2 diabetes in young middle aged women" JAMA ,vol. 292 ,No.8:pp.927-934 ,2004.

8. Yoo, S., and others, "Comparison of dietary intakes associated with metabolic syndrome risk factors in young adults" *Am.J.Clin.Nutr*, vol.80, No.4, pp. 841-848, 2004.
9. Raben, A., and others "Sucrose compared with artificial sweeteners" different effects on ad libitum food intake and body weight after 10 weeks of supplementation in overweight subjects. *Am.J. Clin. Nutr*, vol.76, No.4, pp.721-729, 2002.
10. Hamdy O. and others, "Diet and exercise in type 2 diabetes mellitus" *Endocrinology and metabolism clinics*, vol. 30, pp. 1-21, 2001.
11. Mazza SA, and others, "The diabetes education study: a controlled trial of the effects of intensive instruction of internal medicine residents on the management of diabetes mellitus" *Journal of General Internal Medicine*, vol. 3, No. 1, pp. 1-8, 1988.