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Positive effects of Ramadan fasting on type 2 diabetic patients

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Abstract The aim of this study is to show the effect of Ramadan fasting in diabetics .A total of 18 male and female diabetic patients from Sabha region, Libya, observe Ramadan fasting were recruited for this study and completed all study protocol. Their mean age was 47.8 ± 9.8 years. Weight, height, waist and wreck measurements were taken. Blood samples were collected in two periods, Before Ramadan fasting start and one day before Ramadan fasting finish. Complete blood count (CBC), Serum Insulin levels, c-peptide, plasma glucose levels, HBA1c, total cholesterol and triglyceride were measured. The results showed a significant decrease in weight and waist/wreck ratio, also significant lower values of glycemic control represented by glucose, HBA1c, insulin and c-peptide levels during Ramadan fasting. In contrast; no significant difference in case of cholesterol, triglyceride and CBC between pre and during Ramadan period. This study demonstrated that Ramadan fasting is secure for patients with type 2 diabetes and it could be beneficial for those who are well controlled and balanced.
Keywords: Ramadan fasting, type 2 diabetes, glycemic control and lipid profile.

التاثير الايجابي لصوم شهر رمضان على مرضى النوع الثاني من الداء السكري

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الملخص هدفت هذه الدراسة ت الى معرفة مدى تاثير صوم شهر رمضان المبارك على مرضى الداء السكري النوع الثاني. جُمعت لهذه الدراسة عدد 18 عينة من مرضى الداء السكري النوع الثاني من كلا الجنسيين من مدينة سبها/ ليبيا، متوسط أعمارهم كان 47.8 ± 9.8 سنوات، أخذت منهم قياسات الطول والوزن ومحيط الخصر و الوسط . كما جُمعت منهم عينات دم على فترتين: الاولى قبل بداية شهر رمضان المبارك والأخرى قبل يوم من نهايته. أجريت عدة إختبارات على هذه العينات والتي أشتملت على تعداد الدم الكامل، قياس تركيز هرمون الانسولين في المصل، قياس c-peptide، تركيز الجلوكوز في البلازما، معدل السكر التراكمي، تركيز الكلسترول والدهون الثلاثية في المصل. أظهرت النتائج إنخفاض ملحوظ في الوزن وفي النسبة بين محيط الخصر ومحيط الوسط. بينت النتائج وجود انخفاض معنوي بين تركيز السكر، السكر التراكمي، مستوى هرمون الانسولين ومستوى الـــc-peptide بين الفترتين. في حين لم يوجد أي فرق معنوي في مستوى الدهون وتعداد الدم الكامل بين فترتي الدراسة قبل وخلال رمضان. من هذه الدراسة نستنتج ان صوم شهر رمضان أمن بالنسبة لمرضى السكر النوع الثاني وممكن أن يكون ذو فوائد كبيرة للاشخاص المتحكمين في السكر.
الكلمات المفتاحية: صوم شهر رمضان، الداء السكري النوع الثاني، التحكم في الداء السكري و ومستوى الدهون في المصل.

Introduction

Ramadan is the ninth month in the Islamic calendar. Ramadan fasting is one of the 5 pillars of Islam and one of the most significant worships of Islam and therefore, has significant religious and hence psychological connotations for the person under taken it [1]. It is determined by the lunar calendar; therefore Ramadan is not fixed to any season. The length of daily fasting varies from 12 to 19 hours depending on the season in which the month of Ramadan falls, and from country to country [2]. At this time, Muslims abstain from food, drink and conjugal relationships from dawn until sunset [3], it is obligatory for every healthy adult Muslim except those who are week, sick , actually unwell or those with chronic illnesses in whom fasting may be critical to health , those travelling a distance more than 80 km in one journey [4], also children who have not reached puberty age are exempt from fasting [5]. During fasting healthy Muslim will not allow any substances to pass his or her through including water, oral medications and smoking. As a result of the changes in pattern and frequency of eating and reduction in sleeping and physical activity; many physiological and psychological changes occur during Ramadan [3].

Intermittent fasting has been observed to affect glucose metabolism in normal healthy adults, fasting blood glucose can decrease slightly after several hours of fasting, however this reduction is not sustained due to the fall in insulin level, increase in glucagon concentration and

sympathetic activity that occur soon afterword [6]. In case of diabetic patients; there is unpredictable change in blood glucose levels during fasting. Study of diabetes and fasting in a few Islamic counties have shown that approximately half of the patients with type 1 and two third of patients with type 2 diabetes observe Islamic fasting in Muslim countries [7]. The majority of studies on Islamic fasting indicate that no major problems are encountered by patients with type 2 and even well controlled type 1 diabetes during Ramadan fasting [8]. The amount of energy intake is unchanged or decreased in most patients during fasting and weight loss may be observed [9]. There are no significant changes in FBG, HbA1c, fructosamine, insulin and C-peptide[10;11] levels during fasting, although some studies do show a trend towards better glycemic control [12] while others indicate increase FPG and poor control of diabetes during this month of fasting. Changes in FPG may occur due to the changes in body weight and exercise habits, amount and type of foods consumed, gorging after breaking of the fast, or irregularity of medication compliance [13]. Although increases in total cholesterol levels have been reported [9;12], most patients with either type 1 or type 2 diabetes do not show significant changes in lipid profiles during Islamic fasting [8;14]. In diabetic patients, serum concentrations of blood urea nitrogen creatinine, uric acid, alanine amino-transferase, aspartate amino-transferase, protein and albumin values show no significant changes during Ramadan fasting [10].

Aim

The objective of this study was to estimate the effect of Ramadan fasting on glycemic control, lipid profile and complete blood count in type 2 diabetic patients.

Methods

This study was performed before and during Ramadan Jun 2015 (Islamic year 1437). 21 type 2 diabetic patients (males and females) of Sabha region, Libya were recruited for this study, after they gave their consent to contribute. 18 of them complete all the study. Their mean age was 47.8 ± 9.8 years and who indicated that they were going to fast during Ramadan. Weight and height measurements were obtained, using standardized technique. The body mass index (BMI) was calculated as the weight (kg)/height squared (m)². Waist to wairk ratio (W/W) also calculated. Blood samples were collected from all subjects in plane tubes and EDTA tubes one day before the beginning and one day before the end of Ramadan. Plasma and serum separated from blood samples through centrifugation using C800-1 centrifuge at 3000 RPM for 10 minutes and stored at -20°C. Blood samples were used directly for measurement of HBA1c and CBC. Plasma glucose and serum lipid profile were measured using the commercially available kits (enzymatic colorimetric methods) and spectrophotometer 4040. Serum insulin and c-peptide measured using Auto Immune Analyzer 360 (AIA360) dependent ELISA kits. HBA1c measured using NycoCard HbA1c on NycoCard® READER II and CBC measured using Auto Haematology Analyzer sysmax 300 CBC counter .

Statistical Analysis

All the analysis was done by using the Windows based Minitab 16 statistical Package. Mean and standard deviation were calculated before and during fasting. Paired t test were used to compare between two periods. P- values <0.05 were taken as the level of significance.

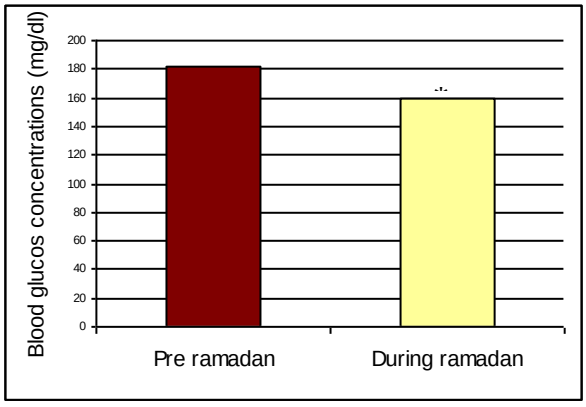
Results

The effect of Ramadan fasting on anthropometric parameters, blood sugar and lipid profile was studied on 21 diabetic volunteers of both sexes. Their main age was 47.8 ± 9.8 years, some anthropometric parameters was evaluated as BMI and waist/wreck ratio, they were 28.3 ± 3.8 kg/m² and 0.99 ± 0.06 before Ramadan and 26.4 ± 3.3 kg/m² and 0.95 ± 0.04 during Ramadan respectively. However there was no significant difference between the BMI before and during Ramadan and it was significantly difference in case of w/w was shown in table (1). The results for blood glucose parameters before Ramadan were as follows: FBS 181.4 ± 32.8 mg/dl, HBA1c 8.6 ± 1.7 %, Insulin level 7.8 ± 3.2 and c peptide 2.4 ± 1.4. These parameters were significantly decreased during Ramadan to 159.4 ± 53.6 mg/dl, 6.8 ± 1.3, 4.9 ± 2.8 and 1.1 ± 0.6 respectively as shown in figure (1&2).

Table(1) shows the anthropometric measurements before and during Ramadan.

	Before Ramadan	during Ramadan	P-value
Age (years)	47.8 ± 9.8	47.8 ± 9.8	-
Wight (kg)	88.9 ± 9.1	83.5 ± 8.0	0.05*
Height (m)	1.8 ± 0.1	1.8 ± 0.1	-
BMI (kg/m²)	28.3 ± 3.8	26.4 ± 3.3	0.13
Waist	104.2 ± 8.1	97.8 ± 7.6	0.02*
Werk	104.7 ± 5.5	103.4 ± 5.6	0.4
w/w	0.99 ± 0.05	0.95 ± 0.04	0.006**

A.



B.

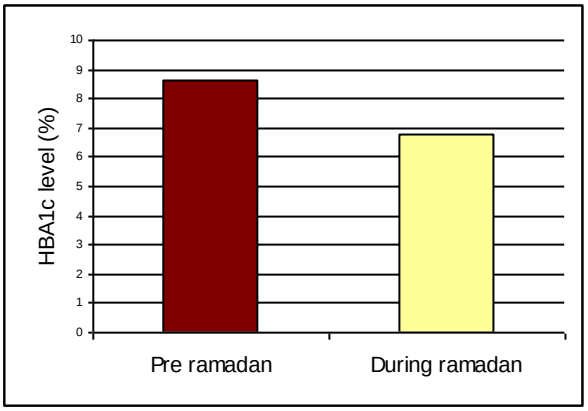
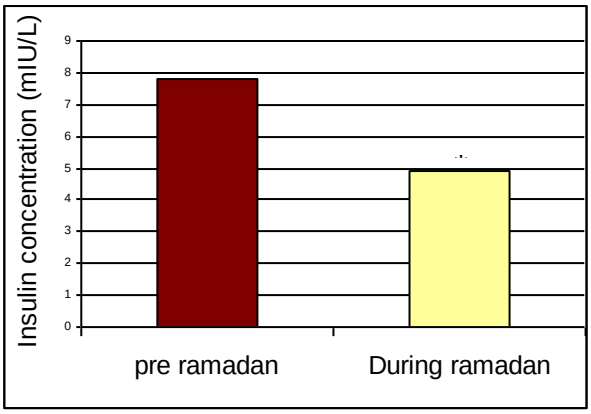


Fig.1 A- shows the concentrations of blood glucose concentration before and during Ramadan fasting. B- Shows the HBA1c level before and during Ramadan fasting.
(*)Significantly reduced.

A.



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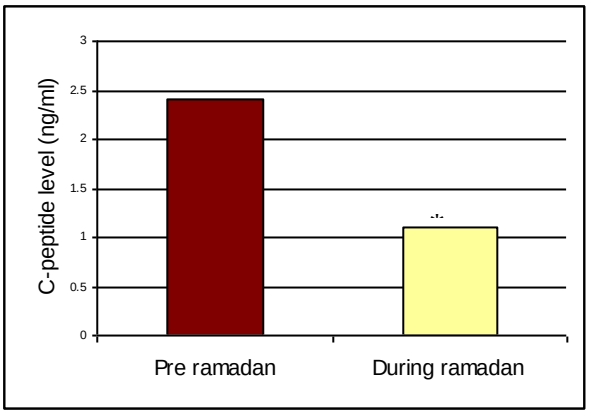
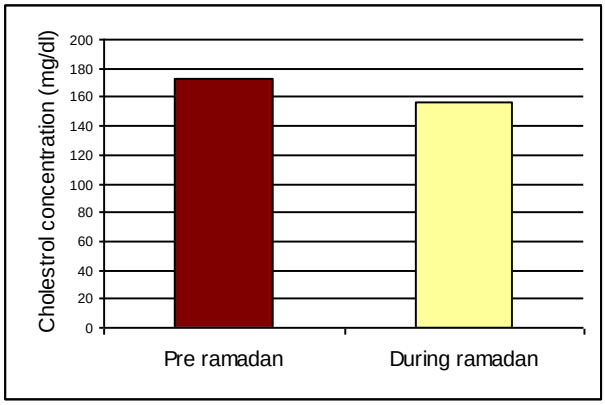


Fig.2 A- shows the concentrations of blood insulin before and during Ramadan fasting. B- Shows the level of c-peptide before and during Ramadan fasting.
(*) Significantly reduced.

In case of lipid profile, only cholesterol and triglyceride was measured in this study and their concentrations before Ramadan were 173.0 ± 29.8 and 146.1 ± 46.2 mg/dl respectively, these concentrations were not significantly reduced during Ramadan to 157.0 ± 28.7 mg/dl and 127.1 ± 56.4 mg/dl as shown in fig (3a&b). Lastly, Ramadan fasting had no effect on CBC parameters, they were not significantly different before and during Ramadan, data represented in table (2).

A.



B.

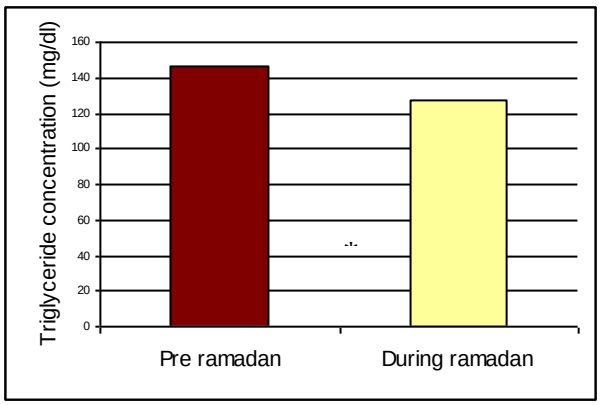


Fig.3 A- shows the concentrations of blood cholesterol before and during Ramadan. B- The concentration of triglyceride before and during Ramadan.

Table (2): shows the mean and SD of Hb concentration and CBC before and during Ramadan fasting.

	HB (g/dl)	RBC $X10^{12}/L$	WBC $X\ 10^9/L$	Platelets $X10^9/L$
Before Ramadan	13.6 ± 1.6	5.0 ± 0.5	6.4 ± 1.2	219.1 ± 35.9
during Ramadan	13.6 ± 1.3	4.9 ± 0.4	6.5 ± 1.2	237.9 ± 39.2
P- value	0.94	0.51	0.85	0.14

Discussion

This study examined the changes in metabolic parameters in type 2 diabetic patients who observe Ramadan fasting in Sabha region. The mean difference between pre-Ramadan and during-Ramadan body weight was 5.5kg. Significant reduction in body weight and w/w ratio. Many studies have reported weight loss during Ramadan[15], Mansi' study demonstrated reduction in body weight among Jordanian students by 3 kg [16]. In contrast, a study in Saudi Arabian reported weight gain during Ramadan [17], and others did not find any significant change in body weight [3;8]. The Epidiar study revealed weight was unchanged in the vast

majority of patients with type 1 and type 2 diabetes [7]. In addition to that, this study demonstrated significant effect of fasting on w/w ratio. Body has regulatory mechanisms that activate during fasting; there is efficient utilization of fat and slow down of basal metabolism [15]. In present study the metabolic parameters were examined, significant reduction in glycemic parameter was observed (glucose, HBA1c, insulin and c-peptide). The primary metabolic priority is the provision of adequate glucose for brain and other vital tissues**,** such as red blood cells, peripheral nerves and renal medulla. The rate of glucose turnover is 2 mg/kg/ minute in the post absorptive state. In normal adults, a slight decrease in serum glucose of between 3.3 to 3.9 m mol/L (60-70 mg/dl) occurs within a few hours after fasting; the fall in serum glucose however ceases due to breakdown of glycogen, and a decrease in both glycogen synthesis and glycolysis in the liver. These changes are a result of a fall in insulin and rises in glucagon and sympathetic activity. In the first few days of Ramadan fasting serum glucose may decrease slightly, normalizing by the 20th day and showing a slight rise by the 29th day [18]. Siaw (2016) demonstrated large change in HBA1c during Ramadan, where as the other metabolic parameters did not appear to change significantly [19]. Similarly, study on 88 Iranian diabetic patients a significant deterioration in FBG and HbA1c [20]. In Tunis Bouguerra (2006) showed no effect on glycemic control were found during Ramadan month. Ramadan fasting in type 2 diabetic patients seems to cause slight effects on glycemia levels when previous metabolic control is quite good; but fasting induces more deterioration when previous control is poor [21]. Diabetes was well-controlled in diabetic patients with dietary/medical management, without serious complications in Hospital Ibn Sina, Rabat, Morocco. The results also showed decreased fasting and post-prandial glucose levels, while insulin levels increased. Diabetes was well controlled, as indicated by HbA1c, fructosamine, C-peptide, HOMA-IR, and IGF-1 values [1]. Other study in Raid, showed no significant effect of Ramadan fasting on other finding of this study was that the Ramadan fasting has no effect on cholesterol and triglyceride levels, as there was slight decrease in their concentration which is not significant. This might be related to high caloric diet usually consumed during Ramadan in Libya. Ramadan fasting in type 2 diabetic patients seems to cause slight effects on glycemia and lipoprotein levels when previous metabolic control is quite good; but fasting induces more deterioration when previous control is poor [21]. Siaw (2016) found the changes in LDL-C and TG during Ramadan to be clinically insignificant regardless of baseline glycemic control [19]. A prospective study of 120 patients who fasted during Ramadan also reported insignificant changes in LDL-C and TG levels before and after Ramadan. Sari demonstrated slight fluctuations in LDL-C and TG that might be related to the quantity and quality of food consumed during the Ramadan period [22]. Other study show fluctuations in some lipid and haematological parameters [1]. Patients with diabetes show no change or a slight decrease in concentration of cholesterol and triglycerides. Several studies report an increase in HDL cholesterol and improvement in LDL cholesterol [20;23;24]. However, in this study the HDL c and LDL not measured. Lastly there was no effect of Ramadan fasting on CBC in this study, which is in agreement with M'guil study [1].

Conclusion: The present study suggests that fasting in Ramadan is safe for the majority of patients with type 2 diabetes and even it could be beneficial for those who are well controlled and balanced.

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