

## The Effect OF Fasting In Ramadan On Some Serum Parameters Of Apparently Normal Subjects

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### **Abstract:**

Fasting during Ramadan is a religious duty for all healthy adult muslims, fasting is abstention from food and drink from sunset to dawn. The study was conducted on the undergraduate students and officers of the College of Medicine, College of Pharmacy and College of Engineering, University of Tikrit. Twenty five apparently healthy students volunteered participated in the study. Their ages ranging from (18-28) years. Blood sugar, serum calcium, parathyroid hormones, serum phosphate and body weight were measured for this group. The investigations were done in the laboratories of Tikrit Teaching Hospital from Oct. to Nov. 2004. Average duration of the fasting was about 12 hours and maximum ambient temperature ranged from 10-12 C. The study was conducted in three trails. The first trial during a period extending up to one week before Ramadan fasting, the second trail during the 7,8,9th days of Ramadan fasting, the third trail during the 7,8,9th days of Ramadan fasting, the third trail during 27,28,29 th days of Ramadan fasting. There was a non significant decrease in concentration of blood glucose at the beginning of Ramadan as compared to pre-Ramadan values and there was a non significant increase in concentration of blood glucose at the end of Ramadan as compared to pre-Ramadan values. There was a non significant increase in concentration of serum PTH at the beginning of Ramadan as compared to pre-Ramadan values and there was a non significant decrease in concentration of serum PTH at the end of Ramadan as compared to pre-Ramadan values. There was a significant decrease in concentration of serum Ca at the beginning of Ramadan as compared to pre-Ramadan values and there was a significant increase in concentration of Ca at the end of Ramadan as compared to pre-Ramadan values. There was a non significant increase in concentration of serum P at the beginning of Ramadan as compared to pre-Ramadan values and there was no change in the concentration of serum Pi at the end of Ramadan as compared to pre-Ramadan values. There was a non significant decrease in body weight at the end of Ramadan as compared to pre-Ramadan values. The study aimed to evaluate the effect of Ramadan fasting on blood sugar, PTH, Ca, Pi and body weight.

## تأثير الصوم في رمضان على بعض القياسات المصلية في الاشخاص الاصحاء ظاهريا

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**مفتاح البحث:** رمضان، الصيام، كلوكوز الدم، الفوسفات، هرمون الباراثيرويد

### الخلاصة:

الصوم في رمضان هو واجب ديني لكل المسلمين الاصحاء البالغين، الصوم يعني البقاء بدون اكل وشرب من شروق الشمس الى غروبها. الدراسة اجريت على طلاب وموظفي كلية الطب، كلية الهندسة وكلية الصيدلة في جامعة تكريت. شملت هذه الدراسة 25 متطوعا وتم قياس مستوى كلوكوز الدم، هورمون الباراثيرويد، الكالسيوم، الفوسفات ووزن الجسم. الدراسة اجريت في مختبر مستشفى تكريت التعليمي للفترة من شهر تشرين الاول الى شهر تشرين الثاني لسنة 2004. تم جمع العينات في ثلاث زيارات، الزيارة الاولى كانت قبل رمضان اسبوع، الزيارة الثانية كانت خلال الايام السابع والثامن والتاسع من رمضان، والزيارة الثالثة كانت خلال الايام السابع والعشرين والثامن والعشرين والتاسع والعشرين من رمضان. حيث قمنا بدراسة اثر الصيام في رمضان على مستوى كلوكوز الدم، الكالسيوم، الفوسفات، هورمون الباراثيرويد، وعلى وزن الجسم. في هذه الدراسة كان هناك انخفاض غير معنوي في تركيز كلوكوز الدم في بداية رمضان من (4.64 mmol/l) الى (4.47 mmol/l) بالمقارنة الى ما قبل رمضان وكان هناك زيادة غير معنوية في تركيز كلوكوز الدم في نهاية رمضان من (4.64 mmol/l) الى (4.77 mmol/l) بالمقارنة الى ما قبل رمضان. كان هناك زيادة غير معنوية في تركيز الكالسيوم في بداية رمضان من (2.19 mmol/l) الى (2.00 mmol/l) بالمقارنة الى ما قبل رمضان وكان هناك زيادة معنوية في تركيز الكالسيوم في نهاية رمضان من (2.19 mmol/l) الى (2.32 mmol/l) بالمقارنة الى ما قبل رمضان. كان هناك زيادة غير معنوي في تركيز الفوسفات في بداية رمضان من (1.26 mmol/l) الى (1.31 mmol/l) بالمقارنة الى ما قبل رمضان ولم تكن هناك تغيير في تركيز الفوسفات في نهاية رمضان بالمقارنة الى ما قبل رمضان. كان هناك انخفاض غير معنوي في وزن الجسم في نهاية رمضان بالمقارنة الى ما قبل رمضان

### Introduction:

Fasting during Ramadan is a religious duty for all healthy adult muslims, fasting is abstention from food and drink from sunset to dawn, Ramadan is the ninth month of the Islamic lunar calendar.(1,2).

Fasting means going without food and water for many hours (3). The experience of fasting teaches Muslims self discipline and self restraint, fasting is not obligatory for children, menstruating women, pregnant and lactating women are permitted to postpone the fasting during Ramadan(1,2). During Ramadan, the majority of Muslims have two good sized meals, one immediately after sunset and the other just before dawn, they are allowed to eat and drink between sunset and dawn but not after dawn, the month of Ramadan is either 29 or 30 days(4,5). The effects of experimental short-term fasting on carbohydrate metabolism have been reviewed extensively(6,7). The post-absorptive period of very early adaptation to fasting, the primary metabolic priority of this period is the provision of adequate glucose for the cells of the brain, red blood cells, peripheral nerves and renal medulla, in the early

stage of the post-absorptive period, the fall in glucose is associated with depletion of glycogen stores of the liver, however, these stores are not limitless, there are only 1200 calories stored as carbohydrate in the liver and muscle glycogen, and skeletal muscle lack glucose-6-phosphate and do not release glucose from stored glycogen directly into the circulation, eventually, after about 24 hours of starvation, the glycogen stores become depleted and the only source of the glucose remains to be gluconeogenesis (6,7). The substrate for gluconeogenesis are lactate (and pyruvate), glycerol and amino acids, cortisol is the principle stimulator for the catabolism of muscle protein, these mechanisms will provide the daily glucose needs of the CNS (100-120g) and red blood cells (45-50g). (6). Only a few studies have shown the effect of Ramadan fasting on serum glucose, one study showed a slight decrease in serum glucose in the first days of Ramadan, followed by normalization by the 20<sup>th</sup> day, and a slight rise by the 29<sup>th</sup> day (8). Other studies shown a mild increase (9,10). Or variation in serum glucose concentration (11,12). Some studies shown a non significant change with Ramadan fasting (13,14,15,16,17). Other studies shown a significant decrease in blood glucose towards the end of the month of Ramadan (18,19).

### **Materials and Subjects:**

The study was conducted on the undergraduate students and officers of the College of Medicine, College of Pharmacy and College of Engineering, University of Tikrit. Twenty five apparently healthy students volunteered participated in the study. Their ages ranging from (18-28) years. Blood sugar, serum calcium, parathyroid hormones, serum phosphate and body weight were measured for this group. The investigations were done in the laboratories of Tikrit Teaching Hospital from Oct. to Nov. 2004. Average duration of the fasting was about 12 hours and maximum ambient temperature ranged from 10-12 C. The study was conducted in three trails. The first trial during a period extending up to one week before Ramadan fasting, the second trail during the 7,8,9<sup>th</sup> days of Ramadan fasting, the third trail during the 27,28,29<sup>th</sup> days of Ramadan fasting. During the first trail and the third trail the body weight was recorded and during each trail five ml of blood was collected without using tourniquet for fasting blood sugar, parathyroid hormones, calcium and phosphate. Five ml of blood was collected from vein by a disposable syringe and centrifuged (centrifuge 1500 r/min) and serum kept in deep freeze at -20C for biochemical analysis (blood glucose, serum calcium, phosphate and parathyroid hormones). The instrument used for the determination of blood glucose is the spectrophotometer. The blood sugar was estimated by glucose kit (Randox, USA), the serum calcium was estimated by the use calcime kit use (Biolabo, France) and the serum phosphate was estimated by phosphate kit (Biolabo, France). The instrument used for the determination of serum parathyroid hormones is Gammacounter. The parathyroid hormones was estimated by the use of parathyroid hormone kit (IRMA, USA).

### Statistical Analysis:

The analysis of variance followed by the students t-test (two tailed) for comparisons between different groups.

### Results:

#### The concentration of blood glucose:1.

As shown in table 1, there was a non significant decrease ( $p > 0.05$ ) in concentration of blood glucose from 4.64 (mmol/l) to 4.47 (mmol/l) in trail 2 as compared to trail 1, there was a non significant increase ( $p > 0.05$ ) in the concentration of blood glucose from 4.64 (mmol/l) to 4.77 (mmol/l) in trail 3 as compared to trail 1

Table(1): The concentration of blood glucose in Trail 1,2,3.

Parameters		Trail 1	Trail 2	Trail 3	t-test
Glucose (mmol/l)	Mean	4.64	4.47	4.77	1-2NS
	S.D	±.84	±.98	±1.51	1-3NS
	SE	.16	.19	.30	1-3 NS

#### The concentration of parathyroid hormone, calcium, phosphate.2.

There was a non significant increase ( $p > 0.05$ ) in concentration of serum PTH from 21.38 (pg/ml) to 27.03 (pg/ml) in trail 2 as compared to trail 1, there was a non significant decrease ( $p > 0.05$ ) in the concentration of serum PTH from 21.38 (pg/ml) to 18.79 (pg/ml) in trail 3 as compared to trail 1 and there was a significant decrease ( $p < 0.05$ ) in the concentration of serum PTH from 27.03 (pg/ml) to 18.79 (pg/ml) in trail 3 as compared to trail 2.

There was a significant decrease ( $p < 0.001$ ) in concentration of serum Ca from 2.19 (mmol/l) to 2.00 (mmol/l) in trail 2 as compared to trail 1, there was a significant increase ( $p < 0.001$ ) in the concentration of serum Ca from 2.19 (mmol/l) to 2.32 (mmol/l) in trail 3 as compared to trail 1 and there was a significant increase ( $p < 0.05$ ) in the concentration of serum Ca from 2.00 (mmol/l) to 2.32 (mmol/l) in trail 3 as compared to trail 2.

There was a non significant increase ( $p > 0.05$ ) in the concentration of serum P from 1.26 (mmol/l) to 1.31 (mmol/l) in trail 2 as compared to trail 1, there was no change in the concentration of serum P in trail 3 as compared to trail 1 and there was a non significant decrease ( $p > 0.05$ ) in the concentration of serum P from 1.31 (mmol/l) to 1.26 (mmol/l) in trail 3 as compared to trail 2 as shown in table (2).

**Table(2):The concentration of parathyroid hormone,calcium,phosphate in trail 1,2,3.**

Parameters		Trail1	Trail2	Trail3	p-value
PTH(pg/ml)	Mean	21.38	27.03	18.79	1-2NS 1-3NS 2-3*
	S.D	±11.76	±15.57	±7.39	
	SE	2.63	3.48	1.65	
Ca(mmol/l)	Mean	2.19	2.00	2.32	1-2** 1-3** 2-3*
	S.D	±.11	±		
	SE	2.663E-02			
Phosphate(mmol/l)	Mean	1.26	1.31	1.26	1-2NS 1-3NS 2-3NS
	S.D	±5.982E-02	±.12	±7.539E-02	
	SE	1.338E-02	2.893E-02	1.686E-02	

### 3. The values of body weight.

There was a non significant decrease ( $p>5.05$ ) in body weight from 61.30(kg) to 60.96 (kg)in trail 3 as compared to trail 1 (table 2).

**Table(3):The Values of body weight in trail 1 and trail 3.**

Parameters		Trail1	Trail3	t-test
Body weight(kg)	Mean	61.30	60.96	NS
	S.D	±10.50	±10.49	
	SE	2.34	2.34	

## Discussion:

### 1.Blood sugar.

Changes of blood glucose in this study agree with that reported by other studies( 8,20,21), and disagree with(18,19),who reported a significant decrease in blood glucose towards the end of the month of Ramadan.This can be explained by a slight decrease in serum glucose to around 3.3-3.9(mmol/l) occurs a few hours after fasting in normal adults,however the fall in serum glucose will cease due to a breakdown of glycogen and increased gluconogenesis, these changes occur because of a fall in insulin and a rise in glucagon and sympathetic activity(7)

These difference may be attributed to the fact that they gave a hypocaloric diet to the volunteers, where as in our case volunteers were free to consume anything they

wanted .Nagra and Gilani(22).have reported a 10 percent increase in glucose level towards the end of Ramadan and has attributed it to gluconeogenesis.From these studies one may assume that during fasting days which follow a rather large meal taken before dawn(sahur),the stores of glycogen,along with some degrees of gluconeogenesis.

From these studies one may assume that during fasting days which follow a rather large meal taken before dawn(sahur),the stores of glycogen,along with some degrees of gluconeogenesis,maintain serum glucose within normal limits,however,slight changes in serum glucose may occur individually according to food habits and individual differences in mechanisms involved in metabolism and energy regulation(7).And also can be explained by low bloodglucose (hypoglycemia) stimulates release of glucose from alpha cells of the pancreatic islets, glucagons acts on hepatocytes(liver cells) to accelerate the conversion of glycogen in to glucose (glycogenolysis) and to promote formation of glucose from lactic acid(lactate) and certain amino acids (glyconeogenesis)(3).Hypoglycemia(during fasting) may be due to an increased rate of glucose utilization by the peripheral tissues(23).As a result,hepatocytes release glucose in to the blood more rapidly, and blood glucose level rises,if blood glucose continues to rise,high blood glucose level(hyperglycemia)inhibits release of glucagons(negative feed back).(3).At the same time,however,high blood glucose(hyperglycemia)stimulates release of insulin from beta cells of the pancreatic islets,insulin acts on various body cells to accelerate facilitated diffusion of glucose in to cells,speed conversion of glucose in to glycogen(glycogenesis)(23).Increased uptake of amino acid and increase protein synthesis,speedsynthesis of fatty acid(lipogenesis)slow glycogenolysis,slow(gluconeogenesis) blood glucose level falls,if blood glucose continues to fall,hypoglycemia inhibits release of insulin(3).

## 2.Parathyroidhormone,Calcium,Phosphate:

Changes of serum PTH,Ca,P level in this study agree with that reported by other studies(8,24).This may be explained by low blood calcium levels stimulate secretion of PTH, the blood calcium level directly controls the secretion of PTH and calcitonin via negative feed back(25).High level of calcium in blood stimulates thyroid gland parafollicular cells to release calcitonin.Calcitonin promotes deposition of blood calcium in to bone matrix,which stimulates parathyroid gland principle cells to release PTH,PTH promotes release of calcium,PTH, also stimulates the kidney to release calcitriol(3). Calcitriol stimulates increased absorption of calcium from foods in the gastro-intestinal tracts,which increases blood calcium levels(26).PTH increases blood calcium levels and decreases blood phosphate level,increases boneresorption and phosphate excretion by kidneys,and promotes formation of calcitriol(3).

## 6. Body Weight:

Changes of body weight in this study agree with that reported by other studies(9,12,17,24,27,28). This is due to the short duration of fasting(30 days) and during this period, there was no valuable effect on the body weight and also the study was conducted on the normal healthy subjects and was not conducted on the persons who were affected by obesity, as we know loss in body weight in the persons affected by obesity more than in the normal healthy subjects(29).

## Conclusions

1. There was a non significant decrease in concentration of blood glucose at the beginning of Ramadan as compared to pre-ramadan values and there was a non significant increase in concentration of blood glucose at the end of Ramadan as compared to pre-ramadan values.
2. There was a non significant increase in concentration of serum PTH at the beginning of Ramadan as compared to pre-Ramadan values and there was a non significant decrease in concentration of serum PTH at the end of Ramadan as compared to pre-Ramadan values.
3. There was a significant decrease in concentration of serum Ca at the beginning of Ramadan as compared to pre-Ramadan values and there was a significant increase in concentration of Ca at the end of Ramadan as compared to pre-Ramadan values
4. There was a non significant increase in concentration of serum P at the beginning of Ramadan as compared to pre-Ramadan values and there was no change in the concentration of serum P at the end of Ramadan as compared to pre-Ramadan values.
6. There was a non significant decrease in body weight at the end of Ramadan as compared to pre-Ramadan values .

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