EFFECT OF RAMADAN FASTING

ON HYPERTENSION AND DIABETES

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ABSTRACT:

The effect of fasting during the Holy month of Ramadan (1416H) on 28 patients (12 male, 16 female) with chronic illnesses was studied. The patients' mean age was 57 $\pm$ 11.9 years. Seven of the 28 patients (4M, 3F) had essential hypertension; 17 (7M, 10F) had NIDDM and 4 (1M, 3F) had both hypertension as well as NIDDM. All the patients were taking oral medications on a regular basis for their illnesses. Initial physical (body weight, blood pressure, pulse rate, height) and laboratory measurement (fasting blood glucose level) were done at the beginning of Ramadan, then at 2 and 4 week intervals. Analysis of the data showed that the systolic and diastolic blood pressure, body weight as well as pulse rate showed decreases during Ramadan. Fasting blood glucose levels increased and fluctuated. A statistically significant difference was observed between the pre- and post-fasting values for some data such as body weight, blood pressure, and fasting blood glucose ($P < 0.05$). However, these differences were small in magnitude. An increase in the fasting blood glucose levels was observed at the end of second week of fasting among all patients, but levels increased more obviously in those patients with Diabetes. It appears that, given the decrease in body weight, that total caloric intake may not increase during Ramadan, but rather, the diet changes in composition, with more food of high sugar content.

Key Words: NIDDM; Hypertension; Body Weight; Fasting Blood Sugar

INTRODUCTION:

During Ramadan, family physicians are often concerned about the effects of fasting on their diabetic patients. They are also concerned about the impact of fasting on patients with hypertension, on treatment, and the advice they should give them. These concerns arise from two sources: first, the knowledge they have about the effects of weight loss on blood pressure readings and fasting blood glucose levels, and second, the lack of information that exists about the effect of fasting on people with these diseases. In a study about dietary regulations and food habits of Moslem, Sakr AH, reported that patients with chronic illness such as non-insulin dependent diabetes mellitus and essential hypertension benefited from weight reduction *(1)*. Both blood pressure and fasting blood glucose levels fall when body weight is reduced *(2-6).* Although Moslems fast during Ramadan between the hours of dawn and sunset, this lengthy period of fasting, has been shown not to produce any harmful effects on healthy individuals *(7-11).* Studies showed that changes in hematological and biological parameters of healthy individuals during Ramadan are minimal *(12)*, while there is a scarcity of data relating to the effects of religious fasting, harmful or beneficial, on patients with chronic illnesses *(13).*

The present study was undertaken with a view to providing physicians with information that might be useful in the future management of patients with specific chronic illnesses, who participate in religious fasts and to find out whether fasting Ramadan has any effect on certain chronic illness such as hypertension and non-insulin dependent diabetes mellitus. This pilot study of selected clinical parameters of 28 fasting patients with diabetes mellitus and hypertension was conducted in Bahrain.

MATERIALS AND METHODS:

Twenty eight patients during the lunar month of Ramadan (9/1416H) falling in January-February 1996 was chosen for this study. The sample consisted of 28 patients out of 41 with hypertension or NIDDM identified during a 3 day period, who visited the health center for follow up. Thirteen patients declined to take part in the study. There were several reasons for this; changes in sleeping and activity patterns, (people do not like to wake up early in the morning, and most of their activities are postponed to the afternoon or the evening), and mistaken beliefs (some of the patients believed that vein puncture to draw a sample of blood for FBG may break their fast).

The health records for the 13 non participants were examined, and no differences were found in their mean age, body weight, blood pressure and FBG readings compared to the 28 respondents. The ages of the sample population ranged between 29-81 years (mean age 57 $\pm$ 11.9 year). Out of the 28 patients, with established clinical diagnosis; 7 (4M, 3F) were hypertensive and seventeen (7M, 10F) had non insulin dependent diabetes mellitus (NIDDM). Four patients had both hypertension plus NIDDM. All the patients were being followed up regularly at their respective clinics in the Health center and all those with NIDDM were on oral Hypoglycemic drugs. The patients were seen one week before the month of Ramadan (called stage 0). An initial assessment of their physical profile was made and data relating to physical examination (body weight, height, blood pressure, and pulse) were taken. Similar assessments were made at the end of the second (stage 1) and fourth weeks (stage 2) of Ramadan, during the fasting period. Efforts were made to standardize techniques of assessments. [On each visit, the same observer measured the patients' body weight using the same scale, the blood pressure using Mercury Sphygmomanometer (to the left arm) and the pulse rate in a one minute time interval. A 3ml of blood sample was also drawn by vein puncture from all the patients for the measurement of Fasting Blood Glucose

(FBG) level using a Reflotron (commonly used in the health centers) after at least 7-9 hr. of fasting].

To determine statistical significance, a paired "t" test was done to assess changes from baseline and unpaired "t" test was done to compare the changes from baseline at stages 1 and 2. The program used was INSTAT, graph PAD software, San Diego, CA, USA.

RESULTS:

Table I shows (mean $\pm$ SD) values for essential clinical parameters which were measured at the beginning (0 stage), at 2 weeks (stage 1) and at 4 weeks (stage 2) in 28 patients with chronic disorders. The data were further analyzed separately for male and female patients.

Among all the patients (table I), there was a significant decrease in the body weight from the pre Ramadan value, both in stages 1 and 2 ($P < 0.05$ and $P < 0.01$). However, despite the decrease in body weight of both females and males, it was only significant among the latter (stage 1 $p<0.05$ and stage 2 $p<0.025$). Although the systolic and diastolic blood pressure were declining as well, the former was marginally significant while the latter declined significantly ($p<0.01$) at stage 2, and among the gender only the male's diastolic blood pressure decreased markedly at stage 2 ($p<0.01$). The increase in the FBG at stage 1 was marginally significant. Although the FBG dropped at stage 2, the mean value remained higher than the pre Ramadan figure.

To evaluate the effect of Ramadan fasting separately on hypertension and NIDDM, data were further analyzed (table 2). The mixed group, i.e. patient with both NIDDM and hypertension (total 4) were examined separately and in detail and were found not to have any different characteristic patterns. However, they resembled more the diabetic group with

regards to the FBG when they showed an increase during mid Ramadan and a decrease by the end of the month. All the other parameters had a similar pattern to those in the NIDDM and hypertensive groups. For this reason, they were included in those groups.

An interesting observation was an increase in FBG level at the end of stage 1 for the diabetic. The statistical analysis showed that the difference was significant ($p<0.05$). The FBG levels later on the 4th week of Ramadan (stage 2) decreased in the NIDDM, but increased among the hypertensive patients. However, eventually no significant differences were observed between the pre- and post- fasting levels. Among the diabetics the amount of changes in the FBG level in stage 1 and stage 2 were significantly different ($p<0.01$).

DISCUSSION:

The literatures are not comprehensive about Ramadan and the impact of fasting on hypertension and NIDDM. Of the few studies relating to the Ramadan *(1, 8-12)* the majority are mainly done on normal healthy persons from the Middle East. Shoukry M., found in his study over 30 healthy individual, that there was a significant increase in the plasma cholesterol and triglyceride by the end of Ramadan. However, he stressed the fact that such relative increase is unlikely to affect normal people *(14).* In another study *(6)* where the hematological and biochemical profile of fasting persons was assessed, the results showed a marginal increase in Hb and PCV by the second week of Ramadan. The level of uric acid was also found to be increased significantly. However, all these changes corrected themselves when Ramadan was over, thus suggesting no harmful effect on the health of a normal fasting person.

This pilot study was done to explore whether Ramadan fasting has an effect on the control of hypertension and NIDDM. However it should be noted that in our study, considerable

individual variability between patients were found in some measurement which is reflected in larger standard deviation compared to the mean. This has to be considered when interpreting the data.

Although the exact frequency of both hypertension and diabetes is unknown in Bahrainis, these chronic disorders are commonly prevalent in the country. Majority of our patients (21/28) were diabetic and all were taking their oral medication regularly at the time of study. Diabetic patients with hypertension are particularly challenging as many of the agents used for lowering blood pressure could affect glucose metabolism adversely. On the contrary in this study it was found that in mid Ramadan (stage 1) the level of FBG increased more among the diabetic than the hypertensive (table 2, 3). During the initial period (1st week) of Ramadan, it is expected that levels of blood glucose and of both cholesterol and triglyceride would decrease due to long duration of fasting and disturbance of the body metabolism and because the patients are not used to eat during the night time. Once stabilized, the progressive increase is expected. However, it was found that the FBG in our study have increased markedly at stage 1 (second week of Ramadan) in the diabetic. Later on, by the end of the month, it decreased but still remained higher than the pre Ramadan level. Other studies have shown increase in FBG by the end of the month however among healthy individuals *(14).* The increase in the FBG in our study could be attributed to many factors of whom the most important were either, i. poor compliance of patients to medication because of change of the feeding behaviour, sleeping pattern and activity during the month, or ii. due to increase in the consumption of sugar rich quality of food during the month.

Analysis of our data also indicated decrease in blood pressure and body weight at the end of fasting period. Some of these differences reached to statistical significance. The resting pulse rate decreased during the month and male experienced a greater reduction than females. Hussein R. et al had similar findings *(15),* and they related this reduction in heart

rate to the increased religious dedication during the month of Ramadan which results in an altered mental state tending to lower metabolic rate and cardiac frequency. A decrease in body weight more than 1.5kg at the end of fasting was noticed in ten (36%) of our patients. This was in accordance with a study from Jordan *(16)* on 137 fasting persons in which significant differences were observed between the initial and final weights.

This study demonstrates those patients with certain chronic illness such as essential hypertension and NIDDM could observe fasting without any harmful effect. On the contrary if patients adhere to the proper fasting instruction without over eating or over consumption of sweet and food rich in sugar could have better control of their illness and get the benefit of reduction of their blood pressure and their body weight. However, such patients should be monitored closely during this month.

The data obtained from this study could eventually be useful in the management of hypertensive and NIDDM patients, as both are major public health problems in Bahrain. However, because of small sample size the finding should be carefully interpreted and a larger study is recommended.

ACKNOWLEDGMENT:

My thank goes to Professor Neil Grant and Professor Ramachandran for their scientific advice.

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TABLE 1: - the changes in various parameters in stage 1 and 2

			Mean ± SD of change from Pre. Ramadan Level		
Variable		**Mean ± SD Pre-Ramadan (Stage 0)**	**At Mid Point of Ramadan (Stage 1)**	**At end of Ramadan (Stage 2)**	**Between change at (1) and (2)**
Weight (kg)	All	70.68 ± 11.27	70.15 ± 11.48 P < 0.05	69.84 ± 11.02 P < 0.01	0.05 < P < 0.1
	M	74.93 ± 10.24	74.03 ± 10.52 P < 0.05	73.6 ± 9.38 P < 0.025	NS
	F	67.5 ± 11.2	67.24 ± 11.62 NS	67.03 ± 11.6 NS	NS
Height (Cm)	All	161.5 ± 8.89	-	-	
	M	168.7 ± 7.4	-	-	
	F	156.1 ± 5.5	-	-	
BMI	All	27.1 ± 3.7	26.9 ± 3.8 P < 0.05	26.8 ± 3.6 P < 0.01	0.05 < P < 0.1
	M	26.4 ± 3.8	26.9 ± 3.74 P < 0.05	25.9 ± 3.29 P < 0.025	NS
	F	27.59 ± 3.6	27.48 ± 3.75 NS	27.39 ± 3.74 NS	NS
Blood Pressure (mm/Hg) Systolic	All	146.5 ± 24.9	144.6 ± 25.2 NS	140.7 ± 28.6 0.05 < P < 0.1	0.05 < P < 0.1
	M	148.6 ± 24.6	148.3 ± 27.5 NS	143.8 ± 26.9 NS	NS
	F	143.6 ± 25.6	141.9 ± 23.8 NS	138.4 ± 30.5 NS	NS
Blood Pressure (mm/Hg) Diastolic	All	81.5 ± 9.3	79.2 ± 10.8 NS	77.9 ± 9.6 P < 0.01	NS
	M	84 ± 5.1	81.9 ± 10.8 NS	79.5 ± 7.5 P < 0.01	0.05 < P < 0.1
	F	78.4 ± 11.1	77.2 ± 10.7 NS	76.7 ± 11.1 NS	NS
Fasting Blood Glucose (mg/dl)	All	169.5 ± 58.6	188.6 ± 69.2 0.05 < P < 0.1	172.1 ± 45.8 N.S.	0.05 < P < 0.1
	M	163.3 ± 33.6	194.2 ± 73.3 NS	176.8 ± 41.3 NS	NS
	F	172.9 ± 71.5	184.9 ± 68.7 NS	169 ± 49.7 NS	P < 0.05
Pulse (Beat/min.)	All	77.4 ± 13.0	75.9 ± 15.2 NS	75.7 ±12.2 NS	NS
	M	76.7 ± 12	74.8 ± 14.6 NS	73.3 ±11.1 NS	NS
	F	78 ± 14	76.6 ± 16 NS	77.5 ± 13 NS	NS

*** N.S. = Not significant** **Level of Significance < 0.05**

M = Male : 12 (mean age 57.2±11.9)

F = Female: 16 (mean age 56.3±10.2)

Total No. of patients: 28

Table 2: important physical and laboratory parameters in patients with essential hypertension

HYPERTENSIVE PATIENTS (TOTAL 11)				
		Mean ± SD of change from Pre. Ramadan Level		
Variable	**Mean ± SD (Pre-Ramadan) (Stage 0)**	**At Mid Point of Ramadan (Stage 1)**	**At end of Ramadan (Stage 2)**	**Between change at (1) and (2)**
Weight (kg)	71.6 ± 11.3	70.8 ± 11.5 0.05 < P < 0.1	70.2 ± 11.1 P < 0.025	0.05 < P < 0.1
Height (Cm)	162.4 ± 8.3	-	-	
BMI	27.1 ± 3.4	26.8 ± 3.5 0.05 < P < 0.1	26.6 ± 3.4 P < 0.025	0.05 < P < 0.1
Blood Pressure (mm/Hg) Systolic	149.4 ± 23.3	145 ± 31.6	143.1 ± 35.6	N.S.
Blood Pressure (mm/Hg) Diastolic	83.3 ± 10.4	82.7 ± 13.6	79.7 ± 13.4 P < 0.025	N.S.
Fasting Blood Glucose (mg/dl)	166.9 ± 26.9	163.4 ± 54.6	177.6 ± 50.2	N.S.
Pulse (Beat/min.)	76.4 ± 16.9	79.5 ± 17.7	76.6 ± 14.3	0.05 < P < 0.1

Level of significance < 0.05

*** N.S. Not significant**

(mean age 56.6 ± 113.5)

Table 3: important physical and laboratory parameters in patients with NIDDM

DIABETIC PATIENTS (TOTAL 21)				
		Mean ± SD of change from Pre. Ramadan Level		
Variable	**Mean ± SD (Pre-Ramadan) (Stage 0)**	**At Mid Point of Ramadan (Stage 1)**	**At end of Ramadan (Stage 2)**	**Between change at (1) and (2)**
Weight (kg)	71.6 ± 10.9	71.2 ± 11.2	71.0 ± 10.7 0.05 < P < 0.1	N.S.
Height (Cm)	161.7 ± 8.5	-	-	
BMI	27.6 ± 3.7	27.4 ± 3.8 N.S.	27.4 ± 3.5 0.05 < P < 0.1	N.S.
Blood Pressure (mm/Hg) Systolic	144.3 ± 24.1	142.5 ± 21.5	139.7 ± 25.8 0.05 < P < 0.1	N.S.
Blood Pressure (mm/Hg) Diastolic	79.7 ± 8	77.2 ± 8.2 P < 0.05	76.8 ± 6.9 P < 0.05	N.S.
Fasting Blood Glucose (mg/dl)	170 ± 62.8	198.5 ± 69.8 P < 0.05	171.9 ± 44.2	P < 0.01
Pulse (Beat/min.)	78.9 ± 13.8	75.1 ± 16.4	76 ± 13.1	N.S.

Level of significance < 0.05

*** N.S. Not significant**

(mean age 57.8 ± 10.6)

18 May 1998

Dr. Mohammed Hamoudeh MD, FACP
Qatar Medical Journal
P O Box 3050
Doha
State of Qatar

Dear Dr. Mohammed,

Ref No. 283

Re: Manuscript entitled "Ramadan Fasting and its effect on few chronic illnesses

Thank you for your letter dated 28 April 1998 regarding the acceptance of publication of the above manuscript in your respectable journal.

Please find enclosed copy of the manuscript edited and changes made in accordance with the reviewer's comments.

Thank you and awaiting your response.

Yours sincerely

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Ref No: 283

Title: Ramadan Fasting and its Effect of Few Chronic Illnesses

Changes made:

1. Title changed.

2. Introduction and Discussion shortened.

3. It was mentioned in the manuscript, page 5, first paragraph, “that fasting blood glucose was collected after at least 7 to 9 hours of fasting”

4. The Chief Editor and reviewer’s comments were taken into consideration.

22 June 1998

Dr. A. Al Gehani MD, FRCP Edin, FACA, FESC
Editor-in-Chief
QATAR Medical Journal
P O Box 3050
Doha
Qatar

Dear Dr. Gehani,

Ref No. 283

Re: Effect of Ramadan Fasting on Hypertension and Diabetes

Thank you for your fax of today. Enclosed please find copy of the amended abstract.

Thank you.

Yours sincerely

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