

Effect of Ramadan Fasting on Metabolic Syndrome

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Abstract:

➤ Aim:

Muslims all over the world fast during the Holy month of Ramadan and abstain themselves from taking any kind of food or water during day time. People diagnosed with any kind of illness may abstain from fasting but people continue to fast against medical advice. It is therefore of interest to compare pre and post Ramadan effects on physiological parameters in individuals with metabolic syndrome.

➤ Methodology:

A prospective cohort study was conducted on 28 people diagnosed with metabolic syndrome and diabetes mellitus who were ready to fast for the whole month of Ramadan. The main components of metabolic syndrome assessed for the study were: blood sugar, systolic blood pressure, diastolic blood pressure and body mass index (BMI).

➤ Result:

The mean age of the study population was 46.46 ± 3.61 years, with females (86%) and males (14%). The mean HbA1c was $8 \pm 1.169\%$, and the mean height of the study population was 158.07 ± 7.54 cm. Weight reduced from pre-Ramadan to during Ramadan and post Ramadan assessment periods were highly statistically significant ($p=.000$). BMI showed a reduction in the 3 assessment periods and the difference seen was highly statistically significant ($p=.000$). The comparison of blood sugar at 3 time periods showed that the blood sugar reduced in the study population from pre-Ramadan, during Ramadan and post Ramadan assessment periods and the difference seen was not statistically significant (.385).

Systolic blood pressure seemed to be reduced in the study population from pre-Ramadan, during and post Ramadan assessment periods and the difference showed a borderline significance (.072). Diastolic blood pressure seemed to be reduced in the study population from pre-Ramadan to during and post Ramadan assessment periods and the difference was statistically significant (.002).

➤ Conclusion:

Ramadan fasting have positive effects on parameters of metabolic syndrome like weight, BMI, and blood pressure.

Keywords:- Ramadan, Fasting, Metabolic Syndrome.

I. INTRODUCTION

Ramadan is the holiest month of Muslims and Ramadan fasting is considered as one of the five pillars of Islam¹. Millions of Muslims fast during this month and abstain themselves from having any kind of food, smoking, taking any kind of oral medications as well as intravenous fluids and nutrients during the day from dawn to sunset². They spent most of the time involving in prayers. Daily living routines during the days of Ramadan are altered and affect the eating schedules, amount and types of food consumed, working hours, recreational activities and the sleeping patterns. In food habits the proportion of fat, protein and carbohydrate intake can differ. All these alterations may induce different metabolic changes³.

Metabolic syndrome is characterized by three or more of the five vital disorders: abdominal obesity (Waist circumference of greater than 102 cm in men and greater than 88 cm in women), abnormal Triglyceride level of 150 milligrams (mg/ dL) or greater, HDL cholesterol: Less than 40 mg/dL in men and less than 50 mg/dL in women, systolic blood pressure: 130 (mm Hg) or greater and diastolic blood pressure: 85 mm Hg or greater and fasting glucose: 100 mg/dL or greater.

Some Muslims diagnosed with metabolic syndrome or any kinds of illness are exempted from fasting as it may lead to harmful consequences⁴. However, many of them insist on participating in Ramadan fasting against the advice of their doctors^{3,4}. It is therefore of interest to compare pre and post Ramadan effects on physiological parameters in individuals with metabolic syndrome⁵. There are various reports on the metabolic changes before and after Ramadan in healthy subjects and in patients with metabolic syndrome, the results have been conflicting⁴. Variation in results are due to different variables like ethnicity, number of hours of fasting, climate changes, cultural changes, physical activity and most commonly difference in diet patterns. The present study aimed to assess the body mass index, fasting blood sugar and blood

pressure pre and post Ramadan in patients with metabolic syndrome ^{6,7}.

II. MATERIALS AND METHODS

This prospective cohort study was conducted among 28 people who were on Ramadan fasting and diagnosed with metabolic syndrome and diabetes mellitus. The main components of metabolic syndrome assessed for the study were: blood sugar, systolic blood pressure, diastolic blood pressure and body mass index (BMI).

The adult population with Type 2 diabetes mellitus of the age group of 30-50 years with metabolic syndrome who were ready to fast continuously throughout Ramadan were included in the study. Only the females who were ready to continue their fasting even during the days of menstruation were included in the study. The study excluded individuals who were suffering from any major disease, who were under any kind of therapy or treatment and the females who were not willing to fast during the days of menstruation.

A. Data Collection

Participants were instructed to fast for all 30 days of Ramadan. The females who participated in the study were asked to continue to be in fasting state during the days of menstruation. Body mass index assessment with height and weight measurement. Blood Samples were collected for measuring fasting blood sugar and HbA1c on the day before Ramadan, during second week of Ramadan, and the

day after Ramadan. The systolic and diastolic blood pressure was estimated twice using calibrated sphygmomanometers.

B. Statistical Analysis

Descriptive statistics were used to assess the baseline characteristics of the data. All quantitative variables were expressed as mean and standard deviation and qualitative variables in frequency and percentage. Repeated measures ANOVA were used to compare the metabolic parameters at pre-Ramadan, during Ramadan and post Ramadan time points. All data entered in Microsoft excel and analyzed using SPSS Version 20.00.

III. RESULTS

This prospective cohort study was conducted among 28 diabetic patients with metabolic syndrome who were in Ramadan fasting. The parameters considered were age, gender, height, weight, BMI, HbA1c, blood sugar, systolic blood pressure, and diastolic blood pressure. The range of age varies from 38-50 years and the mean age of the patients were distributed as 46.46 ± 3.61 years, majority (60%) belongs to the age group of 46-50 years. The gender distribution showed that majority (86%) of the study population were females and only 14% were males. The range of HbA1c varied from 6.1% to 11.8% and the mean HbA1c was $8 \pm 1.169\%$, and the mean height of the study population was 158.07 ± 7.54 cm (Table 1).

Parameter		Frequency	Percentage
Age in years (mean±sd)		46.46±3.61	
Gender	Male	4	14.3%
	Female	24	85.7%
HbA1c (mean ± Sd)		8±1.169	
Height (mean± Sd) in cm		158.07±7.54	

Table 1:- Baseline characteristics of the study population

Their mean weight was 70.79 ± 5.66 kg in the assessment of pre-Ramadan time point. Weight reduced during Ramadan and post Ramadan assessment periods was 69.86 ± 5.58 kg and 69.29 ± 5.47 kg respectively. The observed difference was highly statistically significant ($p=.000$).

BMI also showed a reduction in the assessment periods as 28.43 ± 2.44 , 28 ± 2.34 & 27.83 ± 2.34 kg/m² respectively. The standard deviation seemed to be more in pretest compared with during and post-test assessment period. BMI showed a reduction in the 3 assessment periods and the difference seen was highly statistically significant ($p=.000$). The comparison of blood sugar at 3 time periods showed that the mean± Sd in the pre, during and post Ramadan periods were (146.57 ± 53.51 , 146.21 ± 46.67 , 140.18 ± 47.19) respectively. Blood sugar reduced in the study population from pre-Ramadan to

during and post Ramadan assessment periods and the difference seen was not statistically significant (.385).

The parameter systolic blood pressure showed that the mean ± SD in the pre, during and post Ramadan periods were (141.07 ± 14.74 , 136.43 ± 11.61 , 136.43 ± 13.39) respectively. There was a reduction from pre-Ramadan to during and post Ramadan and the average was the same as during Ramadan and post Ramadan. Systolic blood pressure seemed to be reduced in the study population from pre-Ramadan to during and post Ramadan assessment periods and the difference showed a borderline significance (.072).

The diastolic blood pressure at 3 assessment periods showed that the mean ± SD in the pre, during and post Ramadan periods were (87.50 ± 8.44 , 83.57 ± 6.78 , 80.00 ± 8.16) respectively. There was a reduction from pre-

Ramadan to during and post Ramadan periods. The standard deviation seemed to be more in pretest (8.44) compared with during (6.78) and post Ramadan (8.16) assessment periods. Diastolic blood pressure seemed to be

reduced in the study population from pre-Ramadan to during and post Ramadan assessment periods and the difference was statistically significant significance (.002) (Table 2).

Parameters	Pre Ramadan (mean±sd)	During Ramadan (mean±sd)	Post ramadan (mean±sd)	P Value
Weight (Kg)	70.79±5.66	69.86±5.58	69.29±5.47	.000
BMI (Kg/m ²)	28.43±2.44	28±2.34	27.83±2.34	.000
Blood sugar (mg /dl)	146.57±53.51	146.21±46.67	140.18±47.19	.385
Systolic blood pressure (mm Hg)	141.07±14.74	136.43±11.61	136.43±13.39	.072
Diastolic blood pressure (mm Hg)	87.5±8.44	83.57±6.78	80±8.16	.002

Repeated measures ANOVA, P< 0.05: statistically significant

Table 2:- Distribution and comparison of metabolic parameters at pre, during and post Ramadan

IV. DISCUSSION

This study examined the metabolic parameters like weight, BMI, systolic and diastolic blood pressure in patients diagnosed with metabolic syndrome and type 2 diabetes mellitus in a sample population in Kerala during fasting in the month of Ramadan. There were statistically significant changes in weight, BMI, systolic and diastolic blood pressure of the population during pre and post Ramadan.

As a part of the study the individuals have consumed calories lower than their regular diet. The study showed that there was reduction in the weight of the population which is statistically significant. Studies conducted by Sandhya A. M.et. al, Salehi. Et. al, and M. Mafauzy. Et.al. also found a statistically significant reduction of weight in the study population during Ramadan^{6,7,8}. The total abstinence of food and water throughout the day would have contributed the weight loss⁹. Larijani et. al concluded that there was significant decrease in fasting blood glucose¹⁰. Ziaee and colleagues showed that Ramadan fasting would decrease blood sugar level and weight in healthy male population¹¹. Zatollah Asemi and colleagues also concluded that their study did not show any effect on glucose homeostasis¹². Study conducted by Amena Sadiya showed that the weight of the study group decreased and their waist circumference decreased, but there was slight but significant increase in the glucose level and HbA1c after Ramadan⁴. This was in contrary to this study. The study conducted by Peter Hajek et al. concluded that the participants had weight loss within the one month of Ramadan but they regained the weight later¹³. This study conducted on population with metabolic syndrome and type 2 diabetes also showed decrease in blood sugar level and weight and the reduction in weight was statistically significant but that of blood sugar was not significant, but an assessment of weight after that month was not done to know whether the subjects have regained the weight as concluded by Peter Hajek et al. But the study conducted by

Sara et al. showed that the fasting blood sugars significantly increased in a study conducted in Thai population². Study done by Salahuddin et al. also showed reduction in the body weight by the end of Ramadan¹⁴. The reduction in body weight and BMI was concluded in most of the study after Ramadan and Ziaee et al also concluded that Ramadan fasting leads to decrease in blood glucose and body weight¹¹.

The study population had participated in special communal prayer during Ramadan¹⁵. This would have contributed increase in physical activity¹⁵. This may not be applicable to the whole Muslim population who fast, as the sample population was specifically instructed to take low calorie diet during Ramadan. In a study done by Ibrahim Salti et al. it was described that 50% of the Muslim population generally did not change their lifestyle during fasting¹⁶. A reduction in weight may be not be applicable to the whole Muslim population in Kerala, as they generally have a high calorie meal during Ramadan compared to non-fasting other months. Melaine .et. al. found that decrease in food intake and increased participation in communal prayer have good effects on the HbA1c of the study population¹⁵. The study conducted by Sandhya et.al also showed that HbA1c reduced post Ramadan fasting compared to pre Ramadan, but the change was not statistically significant⁶. In this study a repeat HbA1c sample was not collected after Ramadan to know the effect of HbA1c after fasting.

This study showed that fasting has mild lowering effect on systolic blood pressure but it was not statistically significant. Melaine et.al. also had the same result in their study¹⁵. In study conducted by Naif S. Al-barha and colleague, there was no reduction in blood glucose level or systolic blood pressure, but there was statistically significant increase in blood sugar level and systolic blood pressure in their study¹. This study found that Ramadan fasting have mild lowering effect on systolic blood pressure and blood glucose. There was no significant increase in both parameters. But study conducted in Qatar by

Abdulbari Bener and colleague showed that fasting during Ramadan have positive effects in lowering or normalizing the blood pressure, lipid profile, glucose and HbA1c levels which was statistically significant¹⁷. Study done by Sahin et. al. showed the fasting in Ramadan did not worsen the glycemic status of the study group¹⁸. This study compared the glucose levels pre-Ramadan, during Ramadan and post Ramadan and found that the sugars levels were controlled after Ramadan fasting but the result was not statistically significant. There was statistically significant effect of fasting during Ramadan on diastolic blood pressure. But the study conducted by Sandhya A.M. et.al. did not show any statistically significant change in the diastolic blood pressure of the study subjects⁶. No change in systolic or diastolic blood pressure was noted in a study conducted by Sara Ongsara et. al. during Ramadan in Thai population². A significant decrease in both systolic and diastolic blood pressure was noted in study conducted by Salahuddin et. al¹⁴. In a study conducted by J Ramadan in Kuwait showed that exercise during Ramadan showed a significant increase in diastolic blood pressure, but was not statistically significant¹⁹. In fact, J Ramadan concluded that Ramadan fasting does not have detrimental effect on exercise¹⁹. No exercise was advised during the Ramadan fasting in this study except for the special communal prayers at night. There was no calorie intake during day time due to fasting but they were physically active. This would have contributed lowering of blood sugars compared to pre-Ramadan blood sugars. Study by Vahdat Shariatpanahi et. al discussed that a change in the meal pattern and timing to two instead of usual three or more times would have an effect on patients with metabolic syndrome²⁰. This study showed that Ramadan fasting can cause some beneficial effects in some parameters blood sugars, blood pressure, weight, and BMI. This is in concordance with the findings of Attarzadeh Hosseini et. al. where they found that Ramadan fasting have beneficial effects on blood sugar, Cholesterol, insulin sensitivity and blood pressure²¹.

V. CONCLUSION

Ramadan fasting have positive effects in controlling the parameters of metabolic syndrome especially weight, BMI, and Diastolic blood pressure.

LIMITATIONS

Some studies have shown positive effects on HbA1c, Lipid profile, insulin sensitivity, etc. but these parameters were not included in this study. Moreover, the study population predominantly included females, this may be because the male population were not fully convinced of the counselling. A large-scale study involving more participants, both male and female adult population, with Type 2 diabetes mellitus and metabolic syndrome including parameters like pre and post Ramadan HbA1c, any significant complications or hypoglycemia during Ramadan fasting, Lipid profile, physical activity, calorie intake and waist circumference pre and post Ramadan would have given better results. These parameters were not included in the study due to funding and the study population were not

ready to visit hospital frequently for the study. Adjusting the diabetic medications from a physician and a diet plan during Ramadan from a certified dietitian would have given better results with respect to the present study.

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