

# Effect of Ramadan Fasting on Anthropometric Parameters, Blood Pressure, Creatine Phosphokinase Activity, Serum Calcium and Phosphorus in Healthy Students of Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly-UP

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## ABSTRACT

**Background:** Ramadan is the holiest month in the Islamic calendar. Ramadan is 28-30 days fast in which food, liquids and smoking during the day light hours is prohibited. This custom provides a unique opportunity to study the biochemical changes over this time.

**Objective:** To explore any favourable and unfavourable consequences of Ramadan fasting.

**Materials and Methods:** The study was performed on twenty healthy male students of Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, in the month of Ramadan (July-Aug, 2012). Body weight, waist circumference, blood pressure was monitored three times: one week before the beginning of Ramadan, mid of Ramadan (15<sup>th</sup> day) and at the end (29<sup>th</sup> day). Blood samples were also taken at the same times and evaluated for serum creatine phosphokinase (CPK) activity, calcium and phosphorus.

**Results:** Body weight and waist circumference was found to be significantly ( $p < 0.0001$ ) decreased. Mean blood pressure was decreased significantly ( $p < 0.0001$ ) in the initial half of Ramadan but it approached pre Ramadan values at the end of the month. CPK activity was reduced significantly ( $p < 0.0001$ ) at the mid and end of Ramadan as compared to pre Ramadan

values. Serum calcium levels came out to be decreased significantly ( $p < 0.0001$ ) at the mid but at the end it resumed normal values. There was no significant effect on phosphorus level throughout the month.

**Conclusion:** Ramadan fasting has beneficial influences on the anthropometric parameters especially it is a blessing for overweight or obese persons. Our findings contribute to a better understanding of previous reports.

**KEY WORDS:** Ramadan Fasting; Waist Circumference; Blood Pressure; Creatine Phosphokinase; Serum Calcium; Serum Phosphorus

## INTRODUCTION

Fasting is considered to be a healthy practice in many cultures and religions. Modern laboratory studies have shown a positive effect of fasting on longevity. Ramadan is the ninth month of the lunar calendar. Fasting during Ramadan is prescribed by the Holy Quran for every fit adult Muslim.<sup>[1]</sup> During this month all the Muslims must abstain daily to eat, drink and smoke from dawn to dusk and this duration is variable according to season & geographical profile. It ranges from 11-18 hours a day.<sup>[2]</sup> Upon reaching puberty, all healthy Muslims are required to observe fast. Individuals who are sick, travelling, pregnant, breast feeding, menstruating or debilitated are exempted from fasting. Constant restriction on the eating & drinking schedule may have an effect in body biochemical and physiological function. Upon reaching puberty, all healthy Muslims are required to fast. Individuals who are sick, travelling, pregnant, breast feeding, menstruating or debilitated are exempt from fasting.<sup>[3,4]</sup>

Food habits change during Ramadan when meals are taken two times a day—"iftar" as the evening dinner & "sahur" at the end of the night just before dawn.<sup>5</sup> Overall the total daily amount of food decreases. Therefore, it has anthropometric, physiological effects, metabolic and endocrine on the human body.<sup>[6,7]</sup>

In this study, we tried to elucidate the effect of fasting on activity of Creatine phosphokinase (CPK), levels of Calcium (Ca) & Phosphorus (P). CPK levels are elevated in myocardial infarction, rhabdomyolysis, muscular dystrophies, polymyositis, muscle trauma & burns. Severe or prolonged exercise can also increase CPK levels.<sup>[8]</sup> Subnormal CPK levels which may result from reduced muscle mass due to ageing, wasting or cachexia. Alcoholics often have low levels of CPK due to reduced muscle mass.<sup>[9]</sup> Another important indication of low CPK is Rheumatoid arthritis. Ramadan fasting is associated with variable metabolic & endocrine changes in human. Different studies have shown decreased

or unchanged effects on serum Ca and P levels.<sup>[10,11]</sup>

The aim of this study is to evaluate and to compare the effects of Ramadan fasting on blood pressure, body weight, waist circumference, CPK levels, Ca & P levels on healthy males.

## MATERIALS AND METHODS

The work was approved by Institutional Research Ethical Committee and informed consent was taken from the subjects. The study was conducted during month of Ramadan on undergraduate students of Shri Ram Murti Smarak Institute of Medical Sciences (SRMSIMS) during year of 2012 from mid of July to mid of August. Twenty subjects were participated in this study and were fasted the holy month of Ramadan with average duration of fasting of about 15 hours and maximum ambient temperature 35-40 degree C. Fasting venous blood samples were obtained from each subject at the beginning, mid & end of Ramadan.

The subjects (20 males) were aged between 19-32 years and were fasting for the whole month. Histories regarding any medical or surgical illness were taken. They were found to be healthy on general medical examination & none was receiving any medication affecting the studies parameters. Students doing heavy exercise like gym were excluded from study subjects. Body weight, waist circumference and blood pressure was measured three times i.e. pre Ramadan (2 days prior to the beginning of Ramadan)- T1, at 15<sup>th</sup> day-T2, at 29<sup>th</sup> day-T3. Blood samples were analyzed for CPK using enzymatic method<sup>[12]</sup>, serum ionized Ca was measured by CPC method<sup>[13]</sup> & P levels<sup>[14]</sup> by semi-automatic analyzer BTR 830, at T1, T2 and T3.

### Statistical Analysis

The statistical analysis was performed using Graph Pad Prism Quick Calculation, version 5. Data were reported as mean  $\pm$  SD & compared using the paired two tailed Student's 't' test. A probability level of <0.05 was considered as statistically significant.

**RESULTS**

Mean age of the study subjects was  $24.65 \pm 4.38$  years. Pre Ramadan values of CPK were  $117.65 \pm 26.75$  which decreased gradually during Ramadan. The decrease was highly significant ( $p < 0.0001$ ) on day 15 and day 29 as compared to pre Ramadan values (Table 2).

There was a significant ( $p < 0.0001$ ) decrease in concentration of serum Ca at the mid of Ramadan as compared to pre Ramadan values and at the end it approached pre Ramadan values. There was no significant change in concentration of serum P in the mid & end of Ramadan (Table 2). Body weight was significantly ( $p < 0.0001$ ) reduced at day 15 & day 29. Waist circumference was also reduced significantly ( $p < 0.0001$ ) at the mid & at the end (Table 1). There was a significant ( $p < 0.0001$ ) decrease in mean blood pressure at the mid of Ramadan as compared to pre Ramadan values and at the end of Ramadan, the values reached that of pre Ramadan (Table 1).

**Table-1: Variations in the Levels of Body Weight, Waist Circumference and Blood Pressure during the Month of Ramadan**

Parameters	Time			p value
	T1	T2	T3	
Body Weight (kg)	$71.10 \pm 8.20$	$68.75 \pm 8.00$	$68.92 \pm 8.01$	T1-T2* T1-T3*
Waist Circumference (cm)	$84.25 \pm 5.44$	$82.81 \pm 5.60$	$82.15 \pm 6.09$	T1-T2* T1-T3*
Mean Blood Pressure (mm HG)	$94.66 \pm 6.22$	$90.46 \pm 7.36$	$94.31 \pm 6.40$	T1-T2* T1-T3 NS

Values are mean  $\pm$  SD; T1-Pre Ramadan; T2- At day 15; T3- at day 29; \* $p < 0.0001$ ; NS-not significant

**Table-2: Variations in the Level of CPK, Ca and P during the Month of Ramadan**

Parameters	Time			p value
	T1	T2	T3	
CPK (IU/L)	$117.65 \pm 26.75$	$95.21 \pm 22.84$	$84.21 \pm 25.13$	T1-T2* T1-T3*
Ca (mg/dl)	$9.64 \pm 0.32$	$9.20 \pm 0.44$	$9.78 \pm 0.26$	T1-T2** T1-T3 NS
P (mg/dl)	$3.78 \pm 0.50$	$3.78 \pm 0.46$	$3.79 \pm 0.31$	T1-T2 NS T1-T3 NS

Values are mean  $\pm$  SD; T1-Pre Ramadan; T2- At day 15; T3- at day 29; \* $p < 0.0001$ ; \*\* $p < 0.01$ ; NS-not significant

**DISCUSSION**

During the month of Ramadan, Muslims worldwide are obliged to fast during daytime hours and restrict food and drink intake to the period after sunset. People may alter their sleeping habits and stay awake most of the night. Long lasting modifications in the circadian distribution of the eating and sleeping schedule result in various changes in metabolism. This will provide a unique opportunity to study the effect.

The results of our study demonstrate that mean blood pressure (BP) of study subjects decreased significantly in first half of Ramadan and then it resumed the original values by the end of Ramadan. This finding is in accordance with Salhamoud AS et al., (2005)<sup>[15]</sup> and Habbal et al., (1998).<sup>[16]</sup> Few studies reported no changes in resting BP<sup>[17,18]</sup> while isolated studies, in the past, have shown significant decrease in BP after a month of fast.<sup>[19,20]</sup> These variations may be influenced by sleep pattern, activity, eating pattern and hydration status during the month of Ramadan. Resumption of original values of BP in present study may be due to development of adaptation.

Waist circumference decreased significantly which reflects reduction in abdominal adiposity as also concluded by Salhamoud et al., (2005)<sup>[15]</sup> & Sadiya A.<sup>[21]</sup> Body weight was also reduced significantly. These results are in line with the reports of various studies.<sup>[15,22,23]</sup> The decrease in body weight was attributed to efficient utilization of body fat during fasting.<sup>[24]</sup> Overweight or obese persons lose more weight than normal or underweight persons.<sup>[20,25]</sup> Few studies, on the other hand, stated no significant change in body weight during fasting.<sup>[26]</sup>

The levels of serum CPK decreased significantly that may be attributed to decrease in muscle mass which occurs during Ramadan fasting. SM Abbas<sup>[27]</sup> also reported the same results but isolated studies, reported no significant change in the levels of CPK.<sup>[3,28]</sup>

Serum Ca decreased significantly in the initial 15 days of fasting & its levels again rose and

approached pre Ramadan values or slightly higher. This finding is in line with Mohammed F.<sup>[29]</sup> Probable explanation may be decrease in Ca intake during fasting.<sup>[30,31]</sup> Serum parathormone (PTH) increase significantly<sup>[29]</sup> in response to the decrease in serum Ca in the beginning of Ramadan. The increase in serum Ca at the end of Ramadan is due to an increase in the level of PTH at the mid of Ramadan in response to low Ca levels. The increase in serum Ca at the end stimulates the release of calcitonin & inhibition of the release of PTH via negative feedback mechanism.

No significant change in P was found as its intake does not appear to change.<sup>[31]</sup> Mohammed F also reported the same.

## CONCLUSION

Ramadan fasting is actually an exercise in self-discipline. For those who are chain smokers, or nibble food constantly or drink coffee every hour, it is the good way to break the habit, hoping that the effect will continue after month is over. Psychological effects are also there. Fasters feel inner peace and tranquility.

We, therefore, conclude that Ramadan fasting has a significant beneficial effect on the waist circumference and body weight especially it is a blessings for overweight or obese. It does not cause any adverse medical effect. Much of the changes occur during mid of Ramadan like reduction in mean BP and serum Ca levels which reflect altered eating, sleep pattern and hydration status. Muscle mass decreases during Ramadan reflected by decrease in CPK levels. Further, large scale, coordinated studies are needed to explore the findings more accurately.

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