

Red Cell Survival During Ramaḍān Fasting

Mohammed Salim Al-Hadramy, M.R.C.P., Joseph Acquaye, F.W.A.C.P., Awad Omer, F.R.C. Path, F.R.C.E.
Jeddah, Saudi Arabia

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Abstract

Fasting the month of Ramaḍān is a unique metabolic exercise which has not been studied properly. We have carried out the first red cell survival study during Ramaḍān fasting. The subjects were six normal adults and three adult patients with sickle cell disease. All the subjects fasted the whole month. The ranges of $^{51}\text{CrT50}$ for normal subjects and patients were 25-40 and 10-12.5 days respectively. These are similar to the published values for non-fasting subjects. We did not note any harmful effects from Ramaḍān fasting on the red cell survival in our subjects to justify giving advice against fasting.

Key words: Ramaḍān, fasting, sickle cell, chromium

Introduction

Fasting the month of Ramaḍān is obligatory for all adult Muslims, as it is one of the five Pillars of Islam.

“Ye who believe! Fasting is prescribed to you as it was prescribed to those before you, that ye may (learn) self-restraint.¹

All adult Muslims fast every year from dawn until sunset during the month of Ramaḍān, which varies from 29 to 30 days. During the fasting hours, Muslims refrain from eating, drinking and smoking, and maintain sexual continence. At night, none of the above things are prohibited. However, if a person is ill, or if fasting produces a deleterious effect on their health, they are exempt from fasting.

“But if any of you is ill, or on a journey, the prescribed number (should be made up) from days later.²

*From the Department of Medicine
King Abdulaziz University Hospital
Jeddah 21452, Saudi Arabia*

*Reprint Requests: Dr. Mohamed Salim Al-Hadramy
Department of Medicine
King Abdulaziz University Hospital
P.O. Box 6615, Jeddah 21452
Saudi Arabia*

This has to be determined by the person's own experience and by advice from a doctor.

Few reports have described biochemical and endocrine changes in blood³⁻⁶ and fluid and electrolyte balance⁹ during Ramaḍān fasting. In one study¹⁰ it was claimed that there may be a decrease in the mean red cell survival time as a result of Ramaḍān fasting. This was based on the observation of a rise in the mean cell volume and a non-significant rise in the serum iron, although the hemoglobin and the hematocrit were higher during Ramaḍān than the levels were beforehand. Our study was designed to verify this, and to discover whether Ramaḍān fasting has any deleterious effects on hematological values, including red cell survival, in normal subjects as well as sickle cell anemia patients. To our knowledge, this is the first study of red cell survival during Ramaḍān fasting.

Methods and subjects

Nine adult subjects participated in this study including three healthy males, three healthy females and three patients with sickle cell anemia (two females, one male). The range of the ages was 20 to 45 years.

Females were selected based on menstrual cycle such that none had a menstrual period during the time of the red cell survival study (15 days). All subjects maintained the Muslim fasting during

Table 1.

Subjects	Red Blood Cell Count $\times 10^{12}/L$			Hemoglobin GMS%			Erythrocyte Survival $^{51}CrT50$ (Days)
	Before Fasting	Day 10 Fasting	Day 25 Fasting	Before Fasting	Day 10 Fasting	Day 25 Fasting	
Normal Females							
Control #1	4.64	5.03	4.98	14.0	14.8	14.2	28.0
Control #2	4.28	4.11	4.32	13.1	12.8	12.9	40.0
Control #3	5.17	5.33	5.22	12.5	12.8	12.7	37.0
Normal Males							
Control #4	5.25	5.59	5.42	15.6	16.2	15.8	29.0
Control #5	4.82	4.71	4.61	14.9	14.9	14.2	33.0
Control #6	5.19	5.33	5.22	15.8	16.2	15.4	25.0
Female Sicklers							
Patient #1	2.12	2.22	2.30	7.8	7.2	8.0	10.0
Patient #2	2.92	3.10	2.96	9.5	9.7	9.4	12.5
Male Sickler							
Patient #3	4.18	3.96	3.56	8.7	8.4	7.5	11.0

Ramaḍān. Average fasting time was about 15 hours.

The sickle cell anemia patients had been followed for some time in our hospital. Diagnosis in each was confirmed by family studies after finding hemolytic anemia and a single major band at HbS position on electrophoresis. Blood for complete blood count (CBC) was collected in disposable sequestrine bottles. CBC was done in a Coulter Counter Model S + II. Reticulocyte count was done using standard techniques.¹¹ All investigations were done immediately before the month of Ramaḍān, then repeated on days 10, 19 and 25 of that month.

Red Cell Survival Studies

In order to allow time for the effects of the fasting, red cell survival studies begun on day 10 of Ramaḍān. The method used is based on that recommended by the International Committee for Standardization in Haematology,¹² with slight modification to suit our study. Ten milliliters of blood were drawn and added to 1.5 ml of acid citrate dextrose (ACD) solution in a sterile bottle. After centrifugation and removal of most of the plasma, 50 UCi of radioactive Sodium Chromate (^{51}Cr) were added and the contents incubated at 37°C for 30 minutes. The red cells were then washed twice in sterile saline, after which 10 ml were slowly administered to the subject intravenously. One milliliter of the remaining red cells was diluted to 100 ml in distilled water, for use as a standard. Five milliliters of blood were drawn from a vein in the opposite arm 30 minutes after re-injecting

the red cells (day 10). Subjects were then bled after 24 hours (day 1). Three specimens were collected between day 2 and day 7, and then every third day up to day 15 of the study (day 25 of Ramaḍān).

Although this covered the disappearance of 50% radioactivity in sickle cell patients, it was unfortunately not possible to attain the same with normal controls due to the advent of Ramaḍān holidays, four days before the end of fasting. All samples were kept frozen at -30°C. Each set of samples was then thawed and counted on the same day in a Beckmann 4 Alpha Counter. The radioactivity of the day 0 samples was taken as 100% and subsequent counts calculated as a percentage of that. Results were plotted on semilogarithmic graph paper; the line extrapolated and $^{51}CrT50$ were taken as the time when 50% radioactivity had disappeared.

Results

All subjects completed the fasting of Ramaḍān without any significant complications. One female sickle cell patient had marked low back pain on day 14 of fasting. The male patient had pain in the left hip and ankles on day 15 of fasting. No significant changes were noted in the reticulocyte count, MCV, MCH or MCHC. The results are summarized in Table 1.

Discussion

This study has shown that there were no significant ill effects on our fasting subjects. In particular, none

of the sickle cell patients had to break their fasting. The range of $^{51}\text{CrT50}$ for our normal subjects during Ramaḍān was 25-40 days, which fits with the normal value in non-fasting normal subjects.¹¹ The range for sickle cell patients was 10-12.5 days. This lies within the expected range for non-fasting sickle cell patients which is quoted as 8-12 days.¹³ These results show that there is no reduction in red cell survival during Ramaḍān fasting.

The case of the male sickle cell patient is worth discussing in detail. Although his $^{51}\text{CrT50}$ was 11 days, his hemoglobin dropped from 8.7 g/dl before Ramaḍān to 7.5 g/dl on day 25 of the month. His reticulocyte count was 4% and 4.5% on those two days, respectively. His hemoglobin on day 19 of Ramaḍān was 8.6 g/dl and the reticulocyte count was 4.5%. The pain he experienced on day 15 of fasting was associated neither with fever nor with an increase in the intensity of jaundice or reticulocyte count. However, we could not exclude a mild aplastic reaction of the bone marrow as a cause for the later drop in hemoglobin, especially as the reticulocyte count during the time did not rise.

Although we could not document any significant deleterious effect of fasting in our normal subjects, more studies on large numbers of patients are needed before proper advice can be given to patients during Ramaḍān. Meanwhile, every case has to be assessed individually and, if the patient experiences any significant morbidity, he should be exempted from fasting.

Acknowledgement

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References

1. Glorious Qur'ān, Chapter II, Verse 183.

2. Glorious Qur'ān, Chapter II, Verse 184.
3. Fedail SS, et al: Changes in certain blood constituents during Ramaḍān. *Am J Clin Nutr A* 1982; 36:350-353.
4. Gumaa KA, et al: The effects of fasting in Ramaḍān 1. Serum uric acid and lipid concentration. *Br J Nutr* 1978; 40:573-581.
5. Prentice AM, et al: Metabolic consequences of fasting during Ramaḍān in pregnant and lactating women. *Hum Nutr: Clin Nutr* 1983; 37C:283-294.
6. Angel J, Schwartz NE: Metabolic changes from decreased meal frequency in adult male Muslims during the Ramaḍān fast. *Nutr Rep Int* 1975; 11:29-38.
7. Al-Hadramy MS, Zawawi TH, Abdelwahad SM: Altered cortisol levels in relation to Ramaḍān. *Eur J Clin Nutr* 1988; 359-362.
8. Hallack MH, Nomani MZ: Body weight loss and changes in blood lipid levels in normal men on hypocaloric diets during Ramaḍān fasting. *Am J Clin Nutr* 1988; 48:1197-1210.
9. Gumaa KA, et al: The effects of fasting in Ramaḍān. 2. Fluid and electrolyte balance. *Br J Nutr* 1978; 40:583-589.
10. Scott T: The effects of the Muslim fast of Ramaḍān on routine laboratory investigations. *King Abdulaziz Medical Journal*, 1981; Dec. 1 (4):23-35.
11. Dacie JV, Lewis SM: *Practical Haematology*. London: Churchill Livingstone, 1975.
12. International Committee for Standardization in Haematology. A report on diagnostic applications of radioisotopes in haematology. Recommended methods for radioisotope red-cell survival studies. *Br J Haematol*, 1971; 241-250.
13. *Postgraduate Haematology*. Hoffbrand AV, Lewis SM, eds. London: William Heinemann Medical Books Ltd., 1981.