



Ramadan Fasting has a Profound Impact on the Levels of Adrenocorticotrophic Hormone and Cortisol

Fayig Elmigdad^{*}, Mohammed Elmuttalut, Naif Alsoghaier, Hamad Alsaykhan, Abdullah Alnafeesah and Fahad Almatham

Department of Biochemistry, Qassim University, KSA

Abstract

Ramadan fasting is a known factor that affect Adrenocorticotrophic Hormone (ACTH) secretion and subsequently cortisol levels in humans. Single-point measurements of these 2 hormones had not clarified whether this effect of Ramadan is lasting throughout the 30 days of the month of Ramadan. Plasma ACTH had significantly risen on day 2 of fasting (66 ± 5 IU/ml vs. 41 ± 7 IU/ml), while plasma cortisol levels were also significantly elevated from 458 ± 83 nmole/L to 778 ± 107 nmole/L. It is suggested here that this elevation in plasma ACTH and in plasma cortisol levels is primarily due to the effect of Ramadan fasting. After 22 days of Ramadan fasting, the plasma levels of both hormones had returned to their original values before Ramadan suggesting that this effect of Ramadan fasting is primarily due to psychological factors and stress rather than other ones including food and drinks fasting and others. These data were reproducible during the month of Ramadan in the year 2019.

Introduction

Stress during Ramadan fasting (abstinence from ingestion of food and drinks from dawn to sunset each day for 30 days) seems to influence Adrenocorticotrophic Hormone (ACTH) secretion in a significant fashion as reported by El-Migdadi et al. [1] and many other researchers [2]. Subsequently, plasma cortisol levels are also affected by fasting in Ramadan. Other factors seem also to have an impact on ACTH and cortisol levels during the month of Ramadan, but the effect of fasting was suggested to overcome other factors. The alteration in ACTH and cortisol levels in response to Ramadan fasting is in agreement with that reported by Bogdan et al. [2] and many others. All of these reports have used single-point cortisol levels for their studies and it seems likely that further studies are needed to clarify this effect of Ramadan fasting on cortisol levels throughout this month. Measurements of ACTH and cortisol were conducted at the beginning and at the end of Ramadan.

Methods

A group of slim (not obese) and otherwise healthy male students ($n=10$, age 20 to 24 years) was selected. An approved, by the Human Research and Ethics Committee, consent form was signed by all participants. Blood collection and measurements were done on December 25th, 1998, from non-fasting, on December 31st, 1998 (2nd day of Ramadan) from fasting people and on January 20th, 1999 (22nd of Ramadan). Antecubital venous blood was drawn from each subject. Blood was drawn people at the same time of the day, between 1 and 3 p.m. For the fasting group, fasting time was 10 h to 11 h; for the non-fasting group, fasting was 4 h to 5 h. Plasma was prepared from the EDTA plastic tubes containing blood chilled in ice water. It was then centrifuged at 6,000 g at 4°C. The supernatant was then re-centrifuged at 6,000 g at 4°C for another 10 min. Plasma was stored at -20°C. The time between sampling and freezing was less than 3 h. Measurements of ACTH and cortisol levels were conducted by Radioimmunoassay (RIA) using the available commercial kits from DPC (Los Angeles, Calif., USA).

The data for group were averaged and expressed as mean \pm Standard Deviation (SD). Differences in the values of means were subjected to unpaired Student's t test. p values were considered significant where $p < 0.05$.

Results and Discussion

As seen from Table below, plasma ACTH had significantly increased after 2 days fasting (66 ± 5 IU/ml versus 41 ± 7 IU/ml). In a similar fashion, plasma cortisol levels had also significantly

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*Correspondence:

Fayig Elmigdad, Department of Biochemistry, Qassim University, Molecular Genetics and Medical Education, Unaizah College of Medicine, PO Box: 991 Unaizah, Qassim, 51911, KSA,
E-mail: elmigdad@gmail.com

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Table 1: Plasma ACTH and plasma cortisol response to 2- and 22-days Ramadan fasting in healthy male students.

	November 25, 1998 Non- fasting	December 31, 1998 2-days fasting	January 20, 1999 22-days fasting
ACTH (IU/ml)	47 ± 4 ^{**}	66 ± 5 [*]	41 ± 7
Cortisol (nmole/l)	529 ± 71 ^{**}	778 ± 107 [*]	458 ± 83

^{*}p<0.05 compared to its corresponding in non-fasting

^{**}p>0.05 compared to its corresponding in non-fasting

increased from 458 ± 83 nmole/L to 778 ± 107 nmole/L. It seems likely that this increase in plasma ACTH and in plasma cortisol levels are primarily due to the effect of Ramadan fasting. Other stress factors, such as exercise, infections, wounds, immunosuppression and burns had no role in this profound effect of fasting in these individuals as they were selected to have none of these factors. Corticosteroid-binding globulins were not measured in this experiment and they can have an effect on targeting delivery of cortisol to its sites of action [3-5]. These globulins need to be measured in future experiments.

Plasma ACTH and plasma cortisol response to 2- and 22-days Ramadan fasting in healthy male students.

These plasma levels of both ACTH and cortisol had returned to their normal values after 22 days of Ramadan fasting. ACTH was 47 ± 4 IU/ml, similar to those in non-fasting people (41 ± 7 IU/ml). Similarly, plasma cortisol levels were 529 ± 71 nmole/L, which are similar to those non-fasting (458 ± 83 nmole/L). These numbers were insignificantly different.

Al-hadrami et al. [6] had shown that changes in the cortisol rhythm during the last 2 weeks of fasting with reversal of the morning/midnight ratio in some values with morning cortisol returned to normal in all subjects 4 weeks after Ramadan. Our study had shown that measured two points' cortisol levels in early (2 days of fasting) and late Ramadan (22 days of fasting). Perhaps, there is no alteration in the cortisol rhythm in the first days of Ramadan fasting. This is supported by the study reported by Haouari et al. [7], whose experimental setup measured cortisol levels on the 7th day of Ramadan fasting, in a similar fashion to our design. The single-point cortisol levels were reproduced in a smaller scale (n=5) during the 1999 Ramadan fasting (data not shown) [1]. These data were reproducible during the month of Ramadan in the year 2019 (data not shown).

These data support the notion that ACTH, and cortisol, secretion is affected, at least in part, by the stress of the first few days of Ramadan fasting and this effect seems to cease in the later days of Ramadan fasting.

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