

The Influence of Ramadan fasting on the thermic effect of food (TEF): a UAE Study

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Background: Ramadan fasting is an annual form of intermittent fasting with daily food and drink restriction between dawn and sunset. We previously demonstrated that Ramadan fasting induces changes in feeding patterns [1] and energy metabolism and expenditure [2]. However, changes in the thermic effect of food (TEF) remain unexplored. Moreover as males and females practice Ramadan differently, sex-dependent effects remain unexplored.

Aim: to investigate the influence of Ramadan fasting on TEF in healthy male and female participants.

Methods: healthy participants who attended ICLDC and fasted Ramadan were assessed for changes in TEF via RMR (COSMED-Quark RMR machine). Exclusion criteria included incomplete fasting record, chronic/metabolic conditions and/or medication affecting measurements or fasting ability. Of thirty five participants recruited, fourteen consented to RMR and nine to TEF measurements for three durations: (1) Ramadan, (2) post-Ramadan (Day) and (3) post-Ramadan (Night)). In each duration, six readings were taken (one pre-meal (R0) and five post-meal (R1-5); 30 minutes apart). Statistical analysis using repeated measures of ANOVA with post-hoc tukey comparisons were carried out for: (1) each of the six readings compared at each duration and (2) all pre- and post-meal readings compared with each other within the three durations for: (1) the whole study group and (ii) males and females separately.

Results: nine participants completed Ramadan repeated readings, seven completed post-Ramadan (Day) and five completed (Night) measurements. Each RMR reading (R0-5) was compared with its respective reading in each of the three durations and no significant difference was observed in pairwise comparisons **(Panel A)**. Significant differences were observed amongst pre- and post-meal readings during Ramadan ($F(5, 40) = 3.28, p=0.04$) and post-Ramadan (Day) ($F(5, 12) = 6.03, p=0.004$) but not (Night) ($F(5, 9) = 3.27, p=0.18$) after adjusting for sphericity. In multiple comparison analysis, statistically significant differences were observed between pre-meal and post-meal R5 in Ramadan and between pre-meal and post-meal (R2, R3, R4 and R5) at post-Ramadan (Day). Differences between females and males were significant in Ramadan ($F = 9.91, p=0.016$) and post-Ramadan (Day) ($F = 8.56, p=0.032$) but not (Night) ($F = 7.15, p=0.07$) **(Panel B)**.

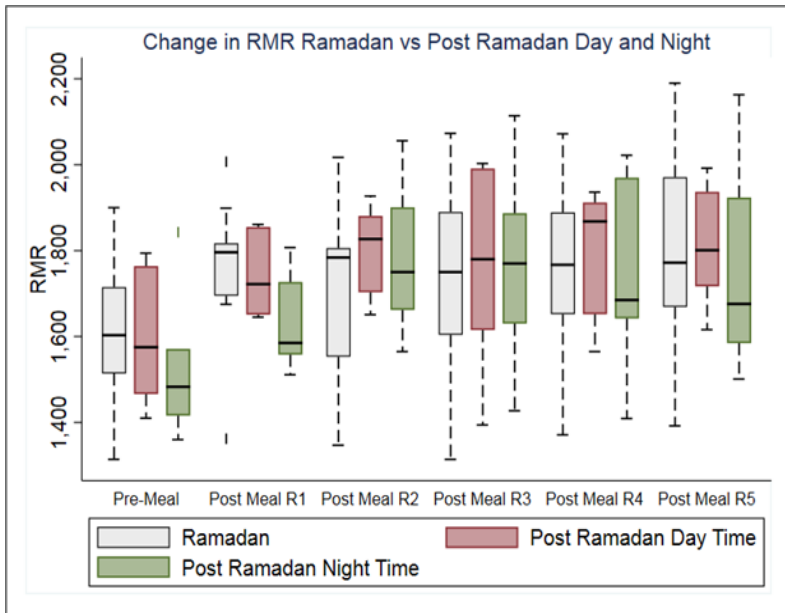
Conclusions: the effect of Ramadan, and Ramadan-type fasting on TEF is not extensively explored; particularly differences between males and females. The herein observed patterns and significant differences suggest potential physiological regulatory factors that necessitate further exploration. Ongoing work with larger participant numbers, endeavors to elucidate such mechanisms. This has potential implications on Ramadan nutrition and metabolism, particularly in individuals with metabolic dysregulation and/or medication.

References

1. Lessan, N. and T. Ali, *Energy Metabolism and Intermittent Fasting: The Ramadan Perspective*. Nutrients, 2019. 11(5).
2. Lessan, N., et al., *The effects of Ramadan fasting on activity and energy expenditure*. Am J Clin Nutr, 2018. 107(1): p. 54-61.

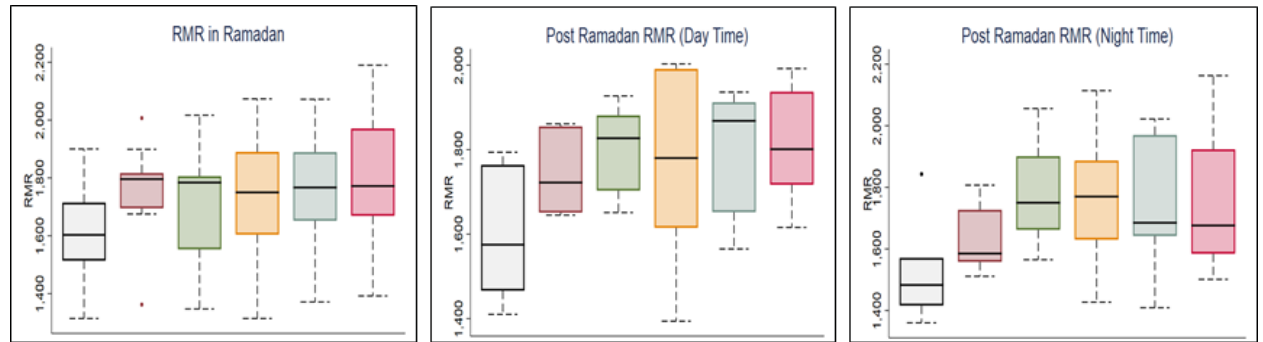
Figure 1.

PANEL A



PANEL B

i)



ii)

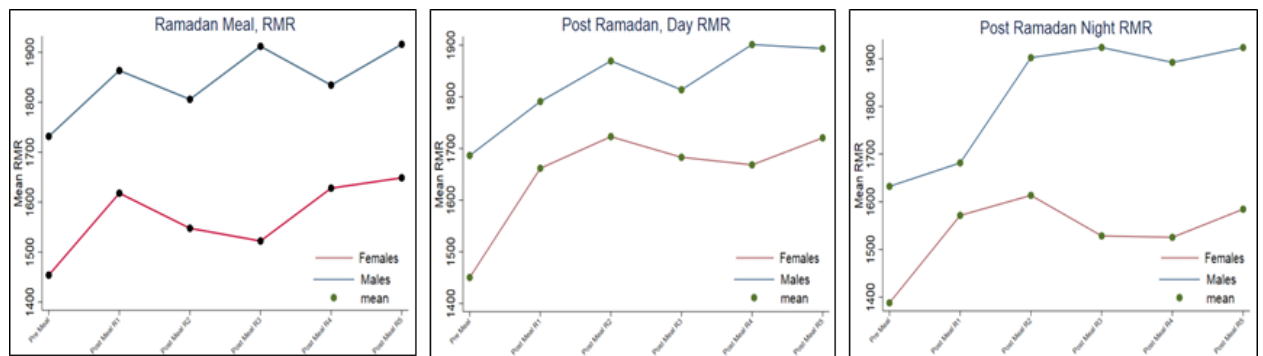


Figure 1. Changes in thermic effect of food (TEF) and resting metabolic rate (RMR) during Ramadan and non-Ramadan fasting periods. Healthy participants completed repeated RMR measurements (one pre-meal and five reading post-meal) during Ramadan (Ramadan), post-Ramadan (Day) and post-Ramadan (Night). In each duration, six readings were taken (one pre-meal (R0) and five post-meal (R1-5); 30 minutes apart). Statistical analysis using repeated measures of ANOVA with Huynh-Feldt correction for sphericity and post-hoc tukey comparisons were carried out for; (1) each of the six readings compared at each duration (**Panel A**) and (2) all pre-meal and post-meal readings were compared with each other within the three durations for the whole study cohort (i) together and (ii) for males (blue line) and females (red line) separately (**Panel B**). **Panel A:** no significance difference was observed in pairwise comparisons.. Significant difference in TEF was observed amongst pre-meal and post-meal readings; during Ramadan ($F(5, 40) = 3.28, p=0.04$) and post-Ramadan (Day); ($F(5, 12) = 6.03, p=0.004$) but not post-Ramadan (Night) after adjusting for sphericity ($F(5, 9) = 3.27, p=0.18$). In multiple comparison analysis, statistically significant differences were observed in; pre-meal RMR and post-meal R5 in Ramadan, pre-meal and post-meal (R2, R3, R4 and R5) at post-Ramadan (Day). **Panel B:** RMR differences between female and male sex were also significant in Ramadan ($F = 9.91, p=0.016$), post-Ramadan day ($F = 8.56, p=0.032$) and non-significant in post-Ramadan night ($F = 7.15, p=0.07$).