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Beyond Weight Loss: Body Composition and Hydration Changes During Ramadan Fasting Among Apparently Healthy Young Adults

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Abstract

Introduction: Ramadan fasting involves prolonged daily abstinence from food and water with changes in meal timing, physical activity, and hydration. This study evaluated changes in body composition and hydration status during Ramadan fasting in apparently healthy young adults from Western Uttar Pradesh, a state in India.

Methods: This prospective observational study commenced after Institutional Ethics Committee approval. Apparently healthy adults, aged 18-45 years, observing Ramadan fasting were recruited. Body weight (BW), body mass index (BMI), waist-hip ratio (WHR), skeletal muscle mass (SMM), body fat, visceral fat, and fluid compartments, including intracellular water (ICW) and extracellular water (ECW), as well as the ECW/total body water (TBW) ratio and resting metabolic rate (RMR) were assessed using bioelectrical impedance analysis before and within one week of completion of Ramadan fasting. Pre- and post-Ramadan values were compared using paired statistical tests.

Results: The mean age of the participants was 26.6±8.5 years, with 26 (72.2%) males, and the mean fasting duration was 27.8±1.1 days. The BW, BMI, SMM, and RMR decreased significantly ($p<0.001$), whereas body fat mass, percentage body fat, visceral fat, and WHR showed no significant changes. There was a significant fall in ICW and ECW without any change in ECW/TBW.

Conclusion: Ramadan fasting was associated with modest but significant reductions in body weight and BMI, accompanied by loss of SMM and body water rather than reduction in fat mass. The decline in RMR suggests metabolic adaptation during fasting. These findings highlight the importance of adequate hydration, nutrition, and physical activity during Ramadan to help preserve lean mass and support healthy fasting practices.

Categories: Family/General Practice, Preventive Medicine
Keywords: anthropometry, bioelectrical impedance analysis, body composition, hydration status, ramadan

Introduction

Ramadan is a form of religious intermittent fasting in which individuals abstain from food and water from dawn to sunset for approximately 29 to 30 days. Observance of Ramadan fasting is accompanied by major lifestyle changes, including altered meal timing, restricted water intake, modified physical activity, and cultural eating practices. These changes together create a distinct physiological environment that may influence body composition and fluid balance.

Altered body composition is one of the most frequently reported outcomes of Ramadan fasting. Studies investigating the effect of Ramadan fasting on body mass and body fat percentage have shown heterogeneous results. Some studies have indicated decreases in body mass and body fat percentage after fasting [1-5]. These reductions are partially attributed to reduced fat mass and total body water (TBW). The reductions in these parameters appear to reverse after Ramadan. Other studies show no changes in body composition [6]. The inconsistency in these changes may be attributed to baseline nutritional status, gender, age, climate, dietary habits, and physical activity [7, 8]. Systematic reviews have also documented inconsistent results [5,9,10]. During fasting hours, individuals do not consume water, which may result in temporary dehydration, particularly during summer months. A significant decrease in intracellular fluid was observed without any change in extracellular water (ECW) and TBW [11].

Despite the large population practicing Ramadan fasting in Western Uttar Pradesh, India, comprehensive prospective studies assessing the effect of fasting on body composition and fluid balance are lacking. This study aims to fill this critical gap by generating evidence specific to Western Uttar Pradesh. The study was planned to evaluate the effect of Ramadan fasting on body composition and fluid balance using bioelectrical

impedance analysis in apparently healthy young adults of Western Uttar Pradesh.

Materials And Methods

This prospective observational study commenced after Institutional Ethics Committee (GIMS-IEC) approval vide letter no. GIMS/IEC/HR/2026/13.5 dated 16.02.2026. Informed written consent was obtained from all the study participants.

Study setting, study sample, eligibility criteria

A non-probability convenience sampling technique was used to recruit eligible participants for the study from a nearby university and relatives of patients visiting the tertiary care hospital. All healthy adults aged 18 to 45 years of both genders observing Ramadan fasting for 13-14 hours per day for at least 24 days and consenting to participate were included. Fasting individuals who were not willing to come for follow-up, pregnant women, and those who were already on some dietary regimen were excluded. The study was conducted in the Lifestyle Modification Clinic under the Department of Physiology of a tertiary care teaching hospital. Ramadan was observed from February 18, 2026, to March 19, 2026.

Sample size

Assuming a moderate effect size (dz = 0.5), $\alpha = 0.05$, and 80% power, the sample size for paired samples was calculated online at https://simplyputpsych.co.uk/tools/sample-size-calculator. The required sample size calculated was approximately 32 participants; considering a dropout rate of 20%, the final sample size taken was 40.

Study variables, data collection procedure and instruments used

At the time of recruitment, gender, age (years), and detailed history of any current or past disease was obtained. In the post-Ramadan visit, the number of days for which the fast was observed was also recorded.

Anthropometric measurements: Standing height was measured using a stadiometer (Prestige Co) to the nearest 0.1 cm. The body weight, body mass index (BMI), and waist-to-hip ratio (WHR) were recorded by a multi-frequency bioelectrical impedance body composition analyzer (BIA; InBody 570, Cerritos, CA).

Body Composition Including Body Fluid Compartment Measurement

This was recorded using a multi-frequency bioelectrical impedance body composition analyzer (InBody 570). The participants were instructed not to have a meal 3-4 hours prior to the test, to avoid tea/coffee or any other beverages at least 4 hours before the recording, and were also instructed to avoid heavy exercise that may cause sweating. After 15 minutes of relaxation, the participants were asked to take off their footwear and socks, firmly place their bare feet on the plate electrodes, grip the handle electrodes with their fingers and palms, and stretch both arms and spread them 30° from the body. They were instructed not to speak or make sudden movements and were asked to maintain a standing posture until the measurement was complete. On completion of the measurement, the result was printed out on a pre-prepared result sheet. The parameters recorded were: skeletal muscle mass (Kg), body fat mass (Kg), body fat level, body mass index (Kg/m^2), visceral fat level, waist-hip ratio, basal metabolic rate (BMR), intracellular water (ICW), ECW, and ECW/TBW.

Body composition was recorded at two time points: (i) pre-Ramadan: on 16th and 17th February 2026; (ii) post-Ramadan: within a week after 26-30 days of Ramadan fasting (between 19th and 25th March 2026).

Statistical analysis

The statistical analysis was done using GraphPad Prism 8.4.2 software (GraphPad Software Inc., San Diego, CA). Data were tested for normality. Continuous variables were expressed as mean ± SD or median (IQR), as appropriate, and categorical variables were presented as frequencies and percentages. For all parameters except visceral fat, the pre- and post-comparison was done using a paired Student's t-test, and visceral fat was compared using the Wilcoxon signed-rank test. P-values < 0.05 were considered statistically significant.

Results

The mean age of participants was 26.6 ± 8.5 years, and 26 (72.2%) were male. The mean height of the participants was 167.6±9.2 cm. The mean duration of fasting was 27.8 ± 1.1 days. Table *1* presents changes in anthropometric parameters following Ramadan fasting. A reduction in body weight was observed in 28 participants (77.8%), while 5 (13.9%) showed weight gain and 3 (8.3%) had no change. Overall, there was a statistically significant decrease in body weight after the fasting period ($p < 0.05$). BMI also showed a significant reduction ($p < 0.05$), whereas no significant change was observed in waist-hip ratio. Out of 40 enrolled participants, 4 did not attend the post-Ramadan evaluation; hence, the analysis included 36 participants.

Variable	Pre-Ramadan	Post -Ramadan	Mean Difference	SD Difference	t-value	p-value
Total body weight (Kg)	65.79 ± 11.55	63.6 ± 10.9	-2.18	2.78	4.6	<0.001*
Body mass index (Kg/m^2)	23.38 ± 3.44	23.01 ± 3.13	-0.37	0.60	3.4	<0.001*
Waist-hip ratio	0.90 ± 0.08	0.89 ± 0.07	-0.01	0.03	1.8	0.0734

TABLE 1: Changes in the anthropometric parameters after Ramadan fasting in the study (n=36)

All values are given as mean ± standard deviation. The data were found to be normally distributed; hence, comparison between pre- and post-Ramadan values was performed using a t-test for paired samples. *p<0.05 was considered statistically significant.

The body composition and body water compartments at baseline and after Ramadan fasting are given in Table 2. Muscle mass decreased in 28 participants (77.8%), whereas an increase and no change were observed in 5 (13.9%) and 3 (8.3%) participants, respectively. A statistically significant muscle loss was observed overall (p<0.05). No significant change was observed in body fat mass; percent body fat and visceral fat levels before and after Ramadan fasting. BMR showed a significant fall after Ramadan fasting. ICW decreased significantly after the fasting period (p<0.05). A decrease in ICW was observed in 28 participants (77.8%), whereas an increase and no change in ICW were observed in 5 (13.9%) and 3 (8.3%), respectively. Likewise, ECW also decreased significantly after fasting (p<0.05). However, no significant change was observed in the ratio of ECW to TBW (p>0.05).

Variable	Pre-Ramadan	Post-Ramadan	Mean difference	SD difference	t-value	p-value
Skeletal muscle mass (kg)	26.77 ±5.23	25.18±5.25	-1.59	0.62	15.4	<0.001*
Body fat mass (kg)	17.72±8.19	17.36±7.59	-0.36	1.65	1.3	0.20
Percent body fat	26.34±10.39	26.28±10.09	-0.06	1.63	0.2	0.83
Visceral fat level; median (IQR)	6 (4-11)	7 (4-11)	-0.21	1.01	1.2	0.29
RMR	1407.9±184.0	1396.7±184.7	-11.21	15.23	4.4	0.0001*
ICW	22.1±4.0	21.8±4.0	-0.28	0.46	3.6	0.001*
ECW	13.3±2.2	13.1±2.3	-0.18	0.28	3.8	<0.001*
ECW/TBW	0.38±0.01	0.38±0.01	0.00	0.00	-	0.18

TABLE 2: Changes in body composition and body water compartments after Ramadan fasting in the study (n=36)

The data are presented as mean ± standard deviation, except for visceral fat level, which is presented as median (IQR)

RMR, resting metabolic rate; ICW, intracellular water; ECW, extracellular water; ECW/TBW, ratio of extracellular water to total body water.

The comparison between pre- and post-Ramadan values was done using a paired samples t-test for all variables except visceral fat, which was compared using the Wilcoxon signed-rank test, as the data were not normally distributed.

*p<0.05 was considered statistically significant.

Discussion

The present study evaluated changes in anthropometric parameters, body composition, and body water compartments following Ramadan fasting in young adults of Western Uttar Pradesh. Ramadan exemplifies a real-world model of intermittent fasting where daytime abstinence from food and water is practiced for a month. It is also associated with changes in sleep timing, meal patterns, and daily activity.

The findings established a statistically significant reduction in body weight and BMI, along with significant loss of muscle mass while fat-related parameters remained largely unchanged. No change was detected in waist-hip ratio, body fat mass, and visceral fat. There was a significant decrease in the volume of ICW and ECW; the ECW and TBW ratio remained unchanged.

In the current study, the participants were of normal weight and showed a significant reduction in body weight; however, no significant change was observed in fat mass. The available literature exploring the effect of Ramadan fasting on body composition and fluid compartments has presented inconsistent results. A systematic review by Fernando et al. (2019) concluded that despite no advice on lifestyle modification, significant reductions in body weight and fat mass were observed in overweight and obese individuals but not in those with normal weight [10]. Fahrial et al. (2016) detected a significant decrease in body weight, BMI, body fat, and water, with no change in protein mass by the 28th day of Ramadan [3]. The fall in body weight and body water validate the findings of this study, while the decrease in body fat and no change in muscle mass contradict our observations.

The systematic reviews by Al-Jafar et al. (2023) and Correia et al. (2020) generated evidence supporting significant reduction in body weight and BMI [5, 11]. Findings of Najafi et al. (2023) revealed a minimal amount of weight loss after Ramadan fasting, attributed mainly to the loss of fat mass with a parallel decrease in ICW [12]. Supporting the findings of this study, significant reductions in lean mass during Ramadan despite stable body fat percentage were found by Amjed et al. (2024), supporting the possibility that weight loss during Ramadan may occur primarily through lean tissue loss [13].

The current study also confirmed a significant decline in resting metabolic rate after Ramadan fasting. This finding was similar to that of Ağagündüz et al. (2021), who demonstrated significant loss of body weight, BMI, fat-free mass, and TBW, along with resting energy expenditure (kcal/d) of the participants [4]. Contrary to our observation, no difference in RMR was observed before and after Ramadan in another study [14].

The decrease in body weight and BMI could be attributed to decreased frequency and time-restricted food intake. Release of catabolic hormones like adrenaline and glucagon [12] during the fasting state could be a possible mechanism contributing to weight loss and decreased protein mass in the fasting individuals. During daytime, individuals do not consume water, which may lead to temporary dehydration, particularly during summer months. An important aspect of the present study is the observed changes in body water compartments. Both ICW and ECW decreased significantly after Ramadan fasting, indicating a state of mild dehydration. The proposed mechanism for the reduction in ICW may be glycogen depletion, as glycogen is stored with bound water in muscle cells [5]. Similarly, decreased ECW may possibly be due to reduced fluid intake during fasting hours and changes in electrolyte balance. However, the ECW/TBW ratio remained unchanged, suggesting that although total body water compartments decreased, the proportional distribution between intra- and extracellular compartments remained stable. This finding may be indicative of fasting-induced uniform reduction in body water rather than a pathological fluid shift.

In the present study, the pattern of significant reduction in body weight with decreased protein mass and RMR with preserved fat mass suggests that the observed weight loss was predominantly attributable to reductions in lean tissue and associated body water rather than adipose tissue. This could be explained by altered protein intake, meal frequency, and reduced resistance-type physical activity during fasting hours. A meta-analysis reported that Ramadan fasting generally results in modest weight loss, much of which is regained after Ramadan, suggesting transient changes related to hydration and lean tissue rather than substantial fat loss [7]. Depletion of glycogen stores during prolonged fasting hours is known to induce water loss, contributing to reductions in body weight. Furthermore, inadequate protein intake, altered meal timing, and reduced physical activity during Ramadan may promote muscle protein catabolism, leading to a decline in protein mass. Reported reductions in fat-free mass during Ramadan indicate that prolonged fasting can affect lean tissue stores under certain dietary conditions [15]. The concomitant reduction in resting metabolic rate is likely explained by the loss of metabolically active lean tissue and adaptive thermogenic responses aimed at conserving energy during periods of restricted food intake [16]. Despite weight loss, preservation of fat mass may reflect increased caloric consumption during non-fasting hours, particularly through energy-dense foods consumed at Iftar and post-Iftar meals compensating for daytime fasting. This recent meta-analysis by Wulandari et al. (2025) concluded that Ramadan fasting generally produces modest reductions in body weight and body composition parameters, with considerable heterogeneity depending on baseline body composition, dietary intake, physical activity, and assessment timing [17].

The absence of a significant change in waist-hip ratio in our study suggests that central adiposity may not be substantially affected over a relatively short fasting duration, particularly in young adults with baseline normal or near-normal BMI. During fasting hours, individuals do not consume water, which may result in temporary dehydration, particularly during summer months. Ramadan fasting affects body water compartments and fat-free mass measurements, suggesting that part of the observed weight loss may reflect hydration changes rather than true fat loss.

The concomitant decline in RMR supports the possibility of adaptive metabolic downregulation in response to reduced energy availability. Adaptive thermogenesis, characterized by a reduction in resting energy expenditure beyond that expected from changes in body composition alone, has been consistently reported during periods of caloric restriction, weight loss, and fasting-related energy deficits [18].

The strengths of this study include the simultaneous assessment of anthropometric, body composition, and

hydration parameters, providing a comprehensive evaluation of physiological changes during Ramadan fasting. However, the small sample size may limit generalizability. In addition, dietary intake and physical activity levels were not assessed, which could have influenced the observed changes.

Conclusions

Ramadan fasting was associated with modest but significant reductions in body weight and body mass index, accompanied by loss of skeletal muscle mass and body water rather than a reduction in fat mass. The resting metabolic rate also decreased significantly. Collectively, these findings indicate that Ramadan fasting may induce metabolic adaptations characterized by conservation of fat stores while reducing lean body mass and energy expenditure with hydration changes. These findings highlight the importance of adequate hydration, nutrition, and physical activity during Ramadan to help preserve lean mass and support healthy fasting practices. The results of this study will help clinicians and public health professionals, to make evidence-based lifestyle recommendations on healthy dietary practices, and physical activity during Ramadan to optimize health benefits and minimize risks and to promote safer fasting practices.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Bharti Bhandari, Ekta Arora, Shreya Jain, Rupali Kalsi, Prerna Agarwal

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. GIMS Institutional Ethics Committee issued approval GIMS/IEC/HR/2026/13.5 dated 16.02.2026. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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