

The Effects of Ramadan Fasting on Body Composition

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Context: Ramadan is the month of fasting in Islam. Fasting is a religious duty for all healthy adult Muslims. During this month, strong persons abstain from different kinds of food and beverage, from sunrise until sunset. They usually eat a larger (300-700 kcal) meal after sunset and a lighter meal (200-500 kcal) before sunrise. Fasting lowers body weight, body fat percentage and body mass index (BMI). It can elevate high-density lipoprotein cholesterol (HDL-c). Al-Hourani HM studies showed that body weight and BMI decreased significantly during fasting. Body weight reduction has been reported quite frequently, whereas, the relationship between weight reduction and loss of body fat has not been studied. The aim of this review is to describe the effects of fasting on several anthropometric parameters on human body, supported by the evidence-based scientific manuscripts.

Evidence Acquisition: Conducting any survey in any scientific field has its own limitations. Carrying out a study in holy Ramadan, with its special circumstances, like altering daily nutritional patterns, fasting hours, less number of daily meals and declining physical activities imposes limitations on any research in this field.

Results: The basic information regarding changes in dietary intake and body composition are as follows: the majority of Muslims typically consume two meals per day during this month, including one just before dawn and another one after sunset. However, most studies demonstrated that fasting, in people without health problems, causes dramatic changes in body composition.

Conclusions: It can be concluded that fasting has various impacts on different individuals. These variations are highly dependent on daily nutritional habits and the season that Ramadan occurs in.

Keywords: Fasting; Body weight; Body Mass Index; Islam

1. Context

Ramadan, the 9th lunar month, is the holiest month in the Islamic calendar. Throughout the world, millions of Muslim fast from dawn until sunset every day in this month; they refrain from drinking and eating during this time (1). Related studies reveal that Ramadan fasting, in people without health problems, causes profound changes in body composition. In many of these studies, basic information, regarding changes in dietary intake and body composition are as follows: the majority of Muslims typically consume two meals per day during this month, one just before dawn and the other one after sunset (2). In the recent years, investigations on energy intake and body composition changes during Ramadan, have had different conclusions that may be due to different nutritional habits and also the duration of fasting (3). Changes in eating habits during Ramadan happen in the form of a reduction in frequency of food and beverage

intake and an increased tendency to high-calorie food and drink consumption (4, 5). These changes can lead to a decline in energy intake, loss of body weight and a state of dehydration. The latter is reflected in body weight reduction and changes in biochemical parameters related to body water status (6, 7). For instance, Al-Hourani HM surveys showed that body weight and BMI decreased noticeably during fasting periods (8). The reduction of body weight has been reported quite repeatedly, but the connection between weight loss and body fat reduction is not often studied (9). Inconsistent findings have also been reported, regarding the effects of fasting on body composition (10, 11). Some investigations did not find any significant changes in body weight or body composition during Ramadan (10-12). Effect of Ramadan on biochemical parameters is still a debatable issue. The aim of this review was to describe the effects of fasting on several biochemical and anthropometric parameters in human body.

Implication for health policy/practice/research/medical education:

The aim of this review is to describe the effects of fasting on several anthropometric parameters on human body, supported by the evidence-based scientific manuscripts.

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2. Evidence Acquisition

Conducting any survey in any scientific field has its own limitations. Carrying out a study in holy Ramadan, with its own special circumstances like altering daily nutritional patterns, fasting hours, less number of daily meals and declining physical activities can impose limitations on any research in this field. This review aimed to cite sensible constraints, by studying other researches on this particular subject.

1. A proper control group are not formed, because most people fast during Ramadan and others who do not, are not qualified for participation in the study due to physical illness.

2. These studies lack focusing on specific social groups like athletes.

3. Various eating habits in different cultures and communities bring about producing imprecise results.

4. There are no accurate methods for estimating the physical activity level or for observing direct effects of activities on body composition during Ramadan.

5. Smokers are not concluded in these researches.

6. Some of these studies have been conducted during specific time periods, mostly in the first or last week of the Holy Ramadan. Researching in different time periods leads to various results.

7. Some researchers did not reach accurate results due to small numbers of participants and studying groups.

8. Individuals on medications were not excluded from the reviewed surveys.

Recommendations for promoting further studies:

It would be a good idea to undertake researches on different age groups rather than focusing on limited ages. It would be a perfect suggestion to evaluate the effects of eating a meal before sunrise on body composition in the future studies.

Period of study should be expanded in these studies and consider alterations not only in Ramadan but also after this common time. It is better to involve individuals from different races in these surveys.

3. Results

3.1. Body Weight and Body Mass Index

Weight reduction can be optimally accomplished with a multimodality approach by adapting a healthy lifestyle through diet modification, physical activity increase and possible pharmacological therapy (13). However, in Ramadan reduced food intake and different nutritional behaviors result in reduction in total body weight, percentage of body fat and resting metabolic rates (3, 9). Heterogeneous findings, regarding the effects of fasting on the BMI, the changes in BMI and nutrient intake (carbohydrates, fat, protein, vitamins and minerals), during the fasting periods in Ramadan may rely on the level of physical activity of the subjects. Since Ramadan starts 11

days ahead each year and it may occur during summer or winter, physiologic changes during Ramadan Fasting (RF) may be influenced by climatic conditions (14). Most studies indicate that weight and BMI decrease noticeably during Ramadan. Despite finding insignificant changes in the total energy intake, Sadyia et al. detected a significant reduction in total weight and BMI after 4 weeks of Ramadan (15). Another survey showed a downward trend in second week of Ramadan in comparison to baseline, however, it increased significantly after Ramadan (8). Similar results have been reported about normal controls in Jordan, while other studies have attributed the weight loss during Ramadan to lower calorie intake (16, 17). It is possible that the weight loss is due to the efficient utilization of body fat during fasting. Unalacak et al. study showed that fasting during Ramadan results in a significant weight loss in obese patients; the weight loss was about 2.9 kg in obese patients and 0.9 kg in non-obese ones. Moreover, the BMI reduced significantly in obese patients, in comparison to non-obese individuals. The average BMI reduction in obese patients was 0.9 kg/m² (18). Also, Fakhrzadeh et al. found that fasting caused a significant reduction in weight and BMI in men and in waist circumference in women (19). In contrary, a study from Saudi Arabia reported weight gain during Ramadan, while others did not find any significant change in body weight (20). Bouhlel et al. studied a small number of elite rugby players and observed a remarkable reduction in the energy intake (28.2%), accompanied by BMI (2.2%) and body fat content (1.3%) decrease by the end of the holy Ramadan (6). Nevertheless, Chaouachi et al. reported that energy and macronutrient intake in elite judo athletes remained similar during Ramadan, although, they observed significant decreases in the BMI and body fat (21). They reported no changes in BM or body fat during Ramadan (22). Changes in fasting plasma glucose (FPG) may occur due to the changes in body weight and physical activity habits, amounts and types of food consumed, gorging after fast breaking and medication compliance irregularity. A moderate weight loss, about 5%, has shown to improve the glycemic and blood pressure control and insulin action, reduce fasting plasma glucose concentrations and improve lipid concentrations (2, 23). The decrease in the body weight can be due to reduction in beverage intake and it can also be endorsed to a decrease in glycogen-bound water stores, extracellular volume reduction secondary to a lower sodium intake and a moderate degree of hypohydration with a slight loss of body tissue.

3.2. Body Water

The insignificant decrease in BMI may also reflect the body water changes. Under ordinary circumstances, one can expect an increase in resting and physical activity during RF due to a decrease in total body water and dehydration. The extent of total body water loss or dehy-

dration and electrolyte imbalance during RF depend on the fasting season. Body water changes during Ramadan may also depend on climate, physical activity habits and physical fitness of the fasting individual (24). Therefore, adaptation to fasting may involve hormones that regulate body water and electrolyte status (9, 22, 25). Ramadan et al. study showed changes in serum osmolarity, sodium and bicarbonate which were not statistically significant in the more physically active group. It suggested that the high water turnover, likely presented in the more active group, allows more precise regulation of the body water than the lower water turnover which is presented in the sedentary group (7). During Ramadan, signs of dehydration have been identified by increased measures of hematocrit, hemoglobin and plasma osmolarity (6, 7, 26). Trablesi et al. study indicated a similar hemoconcentration in resting state and a significantly increased hematocrit, hemoglobin and plasma osmolarity during Ramadan. The state of dehydration has been attributed to drinking reduction (27). Among these studies, only one highlighted the effects of moderate aerobic exercises on blood indicators of body water status, during Ramadan. This research revealed that following aerobic exercises, the values of hematocrit and hemoglobin are significantly higher in Ramadan than those recorded in periods with normal diet. They suggested a state of dehydration, amplified during Ramadan due to the cumulative effects of uncompensated water loss (6). In contrary, Karli et al. observed no changes in body composition and water status, in elite power athletes, during Ramadan (12). Clearly, the reliability of this tool is not confirmed for measuring total body water during Ramadan. Most studies indicated that RF induces dehydration, marked by an increase in blood measures and body water status markers, but no detrimental effects on health have yet been directly attributed to negative water balance, at the levels that may occur during Ramadan.

3.3. Changes of Fat Mass and Fat Free Mass During Fasting

The main limitation of using BMI is that the actual composition of body weight is not taken into account; additional body weight may be made up of adipose tissue or muscle hypertrophy, both considered as excess masses. On the other hand, a shortage of BMI may be due to presence of fat-free mass (FFM) deficit (sarcopenia), mobilization of an adipose tissue or both, combined. The fat-free mass index (FFMI) and fat mass index (FMI) conception are the same as the BMI, but the use of a dichotomous model helps for a reappraisal and appears to be of interest in classification of the overweight (high fat) and underweight (low lean) patients. The division of BMI into FFMI and FMI is obviously not possible without measuring the associated body compositions. By determining these indexes, the amount of FM and FFM excess (or defi-

cit), can be calculated for each individual (28). FFM and FM are important for the nutritional status evaluation. Significant changes in FM and FFM occur during fasting as consequences of the imbalance between energy intake and energy consumption, associated with an increasingly inactive lifestyle.

Many studies showed these two factors (FM and FFM) during this month, due to the changes in the food pattern, moreover, physical activity reduction may be due to an elemental change occurring prior to the Ramadan. In the study of Sadiya et al. the levels of FFM, FM, FM% and FFM% had a slow drop, almost one kg and one percent, respectively, between the first week and fourth weeks of Ramadan (15). In a study undertaken by Mirzaei et al. significant changes in body composition and also about two kg decrease in FFM and FM were reported, among the athletes (29). Furthermore, in another study, the FFM change during Ramadan was detected to be less than two kg (30). However, another study showed that in trained athletes the body weight (BW), BMI, FFM and the body fat percentage do not change significantly during Ramadan. The changes in BW and FFM were less than one kg throughout the same study (12). Showing the frequency of studies are due to the effect of BMI on FM and FFM, therefore, any changes in the two mentioned factors are related to changes in BMI level.

3. Discussion

Cultures and sub-cultures differ in socio-economic backgrounds and dietary habits in Ramadan and the health-specific fasting related findings vary from study to study and sometimes even contradict (31). The likely causes for these heterogeneous findings are the differences between studies, like duration of fasting studied; it is assumed that such a variation may be related to the quality and quantity of foods ingested by Muslims in various countries and sub-cultures (17). Published studies, conducted on small groups of young volunteers, aiming to find out the bio-chemical, anthropometric and physiological changes under standardized strict conditions do not reach findings which can be attributed to the general population. Understanding the previous patterns in Ramadan will hopefully lead to better health promotion, behavior and nutritional modification programs, among various communities. Fasting is a religious obligation, therefore, no randomized controlled trial has been conducted to ascertain its benefits and data available in literature relies on before and after studies (32). Published studies are undertaken on young individuals in heterogeneous communities of diverse cultural backgrounds and dietary habits. Fasting is theoretically a golden opportunity to adopt to a healthy lifestyle and dietary habits, which can lead to weight loss, better control of diabetes and its complications and perhaps other biochemical changes associated to metabolic syndromes.

4. Conclusions

It can be concluded that fasting has different impacts on different individuals. These variations highly depend on daily nutritional habits and the season that Ramadan occurs in.

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Authors' Contribution

Mohsen Mazidi, Ehsan Karimi, Peyman Rezaee, Mohsen Nematy and Mousa Salehi participated in study designing, data gathering and writing of the manuscript.

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