

Effects of Ramadan Fasting on Cardiovascular Risk Factors: A Narrative Review

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Review article</p> <hr/> <p><i>Article History:</i> Received: 23 Oct 2016 Accepted: 18 Dec 2016 Published: 20 Dec 2016</p> <hr/> <p><i>Keywords:</i> Blood glucose Blood pressure Body weight Cardiovascular risk factors Fasting Lipoproteins Ramadan</p>	<p>Ramadan is considered as holy month of Muslims worldwide. During this month, most able-bodied Muslim adults refrain from foods, drinks, smoking, and medications from dawn until sunset. In Islamic rules, patients and those for whom fasting may have major health risks are exempted from fasting during Ramadan. There is still no consensus regarding the effects of Ramadan fasting, as a unique opportunity for lifestyle modifications, on cardiovascular risk factors in the Muslim population. The aim of this scientific literature review was to gather comprehensive results with regard to the effects of Ramadan fasting on major cardiovascular risk factors. This literature review focused on the effects of Ramadan fasting on four main factors, including body weight, blood glucose level, blood pressure, and plasma lipoproteins. According to the results, fasting during Ramadan is a good opportunity for patients and healthy subjects for control and prevent from diabetes, hypertension, hyperlipidemia and perhaps body fat mass as major risk factors of cardiovascular diseases, however diabetic patients need to know about physical recommendations for fasting during. However, limitations of the conducted studies should be considered in specific populations while interpreting the results.</p>

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Introduction

Ramadan is considered as holy month of Muslims worldwide. During this month, Muslim adults abstain from foods, drinks, smoking, and medications from dawn to sunset. Fasting normally continues for 8 to 18 h, based on the season and the geographical location; however, there are no restrictions for eating during the time between sunset and dawn (1, 2). Overall, Ramadan fasting consists of alternate fasting and feasting (re-feeding) periods.

Pregnant, lactating, and sick individuals are exempted from fasting, as it may exacerbate their condition. Two meals per day (before sunrise and after sunset) are usually eaten during this month. Dietary habits and quality of foods change during Ramadan, compared to the rest of the year; therefore, food and fluid intake and nutrient metabolism may vary during this month (3, 4).

Several studies have surveyed various effects of Ramadan fasting on health outcomes in different groups of Muslim population. In general, cardiovascular diseases are identified as a major cause of mortality worldwide (5). The main risk factors for cardiovascular diseases include hypertension, lipid profile abnormalities, obesity, and insulin resistance (6). In this regard, in a prospective observational study, significant improvement was found in Framingham Coronary Heart Disease Risk Score after Ramadan fasting in a group of patients having at least one cardiovascular risk factor (7).

In a previous study, Ramadan fasting was found to improve blood glucose, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and total cholesterol levels, compared to the pre-Ramadan period among collegiate wrestlers (8).

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Also, in a prospective observational study performed in Iran in 2012, fasting in Ramadan was effective in ameliorating HDL level, LDL/HDL ratio, and triglyceride (TG)/HDL ratio (9).

Also, in a randomized trial conducted by Klempel et al. (2012), body weight, heart rate, total cholesterol, LDL-cholesterol, glucose, insulin, and homocysteine levels decreased more significantly in the group with alternate fasting combined with energy and fluid restriction versus the group with alternate fasting combined with energy restriction only (10). Also, smoking decreased during Ramadan, which might be associated with the observed decline in the occurrence of cardiovascular diseases (11, 12).

Although previous studies have assessed the impact of Ramadan fasting on different aspects of human health, no review study has been performed to investigate the impact of Ramadan fasting on cardiovascular risk factors (13, 14). Therefore, the aim of the present study was to review previous studies on the effects of Ramadan fasting on cardiovascular risk factors.

Although previous studies have assessed the impact of Ramadan fasting on different aspects of cardiovascular risk factors in healthy subjects and patients [13, 14], in this narrative review, we try to summarize the results of other studies about the effects of Ramadan fasting on cardiovascular risk factors.

Material and methods

A complete search was performed about the association of Ramadan fasting was in databases electronic through such as ISI web of science, Scopus and PubMed (to access of Latin paper) and also in IrMedx and SID (to access of Persian paper). Two authors (DS and SSK) independently searched papers published until February 2015. No restriction about time of publication or language or study design was made. The search terms that were used were as follows: blood glucose, plasma glucose, lipid profile, lipoproteins, body weight, anthropometric, blood pressure and cardiovascular risk factors were combined with Ramadan/fasting.

After reviewing the title and abstract of the eligible studies, we classified the articles into the following three categories: I) Ramadan fasting and blood glucose; II) Ramadan fasting and blood pressure; III) Ramadan fasting and plasma lipoprotein and IV) Ramadan fasting and body

weight. Accordingly, we present the results of the eligible studies based on each category.

Literature review of major cardiovascular risk factors

The evaluated factors assessed in this review study are as follows:

1. Effect of Ramadan fasting on blood glucose level

Diabetes mellitus is a metabolic impairment, distinguished by high blood glucose level due to impaired insulin secretion or insulin resistance. The prevalence of diabetes mellitus has dramatically increased and has become a global health problem in recent decades. The latest global statistics by the International Diabetes Federation (IDF) have reported 415 million cases of diabetes mellitus in 2015; this number is estimated to rise to 642 million people by the end of 2040 (15).

Diabetes mellitus contributes to a considerable increase in morbidity and mortality rates for cardiovascular diseases. Lifestyle interventions, focused on appropriate food choices and physical activity, play an important role in the prevention of diabetes, compared to medications (16, 17); in fact, Ramadan fasting is a good opportunity for lifestyle modifications. It should be noted that uncontrolled diabetic patients experience major complications, such as hypoglycemia, hyperglycemia, ketosis, and dehydration during Ramadan fasting. Hyperglycemia usually occurs due to overeating in the non-fasting period or negligent use of medications (18-21). Therefore, diabetic patients, who are willing to fast during Ramadan, should follow medical, nutritional, and physical activity recommendations (22).

A meta-analysis of 16 studies on 776 healthy participants (611 in the male subgroup and 165 in another subgroup) indicated that blood glucose level decreased in both male and female subgroups (and in total) during Ramadan fasting (23). Similarly, in another study on 70 patients with type II diabetes mellitus, a significant decline was observed in postprandial plasma glucose level during Ramadan in comparison to pre- and post-Ramadan periods (18). According to the results of the mentioned studies, Ramadan fasting is a good opportunity for primary prevention of diabetes mellitus.

2. Effect of Ramadan fasting on blood pressure

Hypertension is characterized by sustained

systolic blood pressure of 140 mmHg or more, or a diastolic blood pressure 90 mmHg or more (24). Hypertension is universally known as the “silent killer”, since it usually has no signs or symptoms for many years until its complications start to develop in other body organs.

The consequences of hypertension include various degenerative diseases, such as coronary artery disease, chronic kidney disease, heart failure and peripheral vascular diseases (25-27). According to the World Health Organization (WHO), hypertension is becoming an important public health concern in recent decades, and it is estimated that nearly 1.6 billion adults will suffer from hypertension and the complications of cardiovascular diseases by the end of 2025 (28).

Lifestyle interventions, such as increasing physical activity, avoiding alcohol use, reducing body weight, and using dietary approaches to stop hypertension (DASH), have documented efficacy in the prevention and control of hypertension (29, 30). Dietary habits and changes in food quality during Ramadan fasting provide a good opportunity for lifestyle changes in hypertensive patients. Nevertheless, physician's advice should be individualized, and patients are recommended to follow medical advices for fasting in Ramadan.

A case-control study, conducted by Shafei et al., assessed the effects of Ramadan fasting on blood pressure in hypertensive patients (2014). This study showed a significant decline in systolic blood pressure during Ramadan fasting, although there was no significant change in diastolic blood pressure among hypertensive patients, compared to healthy subjects (31). Similarly, Nematy et al. (2012) conducted a prospective observational study on patients with a history of cerebrovascular or coronary artery disease and metabolic syndrome and compared their blood pressure before and after Ramadan fasting. Their study showed a significant decline in systolic blood pressure (133±16 mmHg before Ramadan vs. 130±17 mmHg after Ramadan), whereas there was no significant change in diastolic blood pressure after Ramadan fasting (7).

Furthermore, in a study on 20 healthy subjects, fasting led to a significant decline in mean systolic blood pressure and mean diastolic blood pressure after Ramadan (124±14 mmHg vs. 118±10 mmHg and 82±11 mmHg vs. 77±10 mmHg, respectively) (32). However, in a study on healthy volunteers by Saleh et al. (2005), no statistically significant

changes were observed in the mean blood pressure during Ramadan fasting (33). Based on these observations, fasting during Ramadan has beneficial effects on the control of systolic blood pressure in patients with cardiovascular risk factors. However, further studies are required to elucidate the effects of Ramadan fasting on blood pressure in healthy populations.

3. Effects of Ramadan fasting on plasma lipoproteins

The relationship between cardiovascular diseases and plasma lipoprotein level has been confirmed in the literature (34). The lipoprotein pattern including increased levels of very-low-density lipoprotein (VLDL) and LDL, along with reduced HDL level, is recognized as dyslipidemia, which is thought to elevate the risk of cardiovascular diseases (35, 36). Today, measurement of lipid profile, such as total cholesterol, LDL-cholesterol, HDL-cholesterol, TG, LDL/HDL ratio, TG/HDL ratio, and LDL level, helps predict the risk of cardiovascular diseases.

The proper plasma lipoprotein level for adults is defined as a total cholesterol level < 200 mg/dL, LDL-cholesterol level < 130 mg/dL, HDL-cholesterol level > 40 mg/dL, and TG level < 150 mg/dL (37). Also, LDL-cholesterol level less than 100 mg/dL is recommended for high-risk patients (37). Dietary and lifestyle changes have many positive effects on lipid profile and lipoprotein metabolism (38); these changes may happen during Ramadan fasting. In this regard, a previous study on stable cardiac patients indicated a significant increase in HDL level and a significant decline in LDL, total cholesterol, TG, and LDL/HDL ratio after Ramadan fasting (7).

In another study on healthy volunteers, it was marked that fasting during Ramadan could lead to a significant increase in HDL, LDL, and total cholesterol levels. Also, the aforesaid study revealed a significant decline in serum LDL/HDL and TG/HDL ratios (9). Recently, Kul et al. (2014) conducted a meta-analysis of studies on healthy populations and compared plasma lipoprotein level before and after Ramadan fasting. In their study, a substantial decline was observed in total cholesterol, LDL, and TG levels in the male subgroup after Ramadan fasting. However, in another subgroup, total cholesterol and TG levels were constant, while HDL-cholesterol level increased and LDL-cholesterol level decreased

(23). According to the findings of the mentioned studies, fasting during Ramadan might have positive effects on lipid profile.

4. Effect of Ramadan fasting on body weight

The relationship between body weight and cardiovascular risk factors has been confirmed in various studies. Body fat mass and fat distributions are more proper predictors for the risk of cardiovascular diseases, compared to body weight (39). Changes in body weight have been frequently reported in studies on Ramadan fasting; however, the association of body fat mass with Ramadan fasting has not been often studied.

In this regard, a meta-analysis of 21 published articles revealed the effects of Ramadan fasting on body weight in healthy subjects. The findings of this study showed the positive effects of fasting on body weight only in the male subgroup (23). Similarly, another meta-analysis was performed to investigate weight changes during Ramadan fasting in general population, it was marked that fasting during Ramadan could lead to significant weight loss (-1.24 kg; 95% CI: -1.6, -0.88 kg).

However, in the aforementioned study, the lost weight mainly returned within few weeks after Ramadan and only a slight decline was observed in body weight (40). Overall, according to the findings of the discussed studies, Ramadan fasting is a good opportunity for weight loss. However, weight changes during Ramadan fasting strongly depend on the length of fasting and feasting (re-feeding) periods.

Conclusion

Fasting during Ramadan causes some positive effects on major cardiovascular risk factors. However, limitations of these studies should be considered in specific populations while interpreting the results. Further studies should be performed in these areas in order to obtain more comprehensive and accurate results.

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