

# Effects of Ramadan Fasting on Blood Pressure in Hypertensive Patients: A Systematic Review

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Review article</p> <hr/> <p><i>Article History:</i> Received: 16 Jan 2016 Accepted: 5 Feb 2016 Published: 9 Feb 2016</p> <hr/> <p><i>Keywords:</i> Blood pressure Fasting Hypertension Ramadan Systematic review</p>	<p>Ramadan is a holy month for Muslims and fasting in this month is the rule for any healthy matured person. Nutritional and behavioral changes occurred during Ramadan fasting may lead to several physiological change, such as blood pressure. Studies evaluated the effects of Ramadan fasting on blood pressure in hypertensive patients, are scarce and reported inadequate results. In this paper a systematic review was performed to accumulate the results of published literature designed to evaluate blood pressure changes in hypertensive patients due to Ramadan fasting. All prospective, English studies which evaluated the effects of Ramadan fasting on blood pressure in hypertensive patients and measured systolic and diastolic blood pressure twice at least (before Ramadan and during last week of Ramadan or after Ramadan fasting) were included in systematic review.</p> <p>Five studies reported the effect of Ramadan fasting on blood pressure in hypertensive patients in full text.</p> <p>Although significant reduction in systolic blood pressure during Ramadan fasting were seen in 3 studies, other 2 studies reported no significant difference between systolic blood pressure before and after Ramadan fasting. Among 5 studies that reviewed in this paper, 3 studies reported no significant changes in diastolic blood pressure. Two other studies reported significant reduction in systolic blood pressure after Ramadan fasting.</p> <p>This systematic review suggested that Ramadan fasting can be safe in treated essential hypertensive patients with continuation of previous medications. Also it can improve systolic and diastolic blood pressures.</p>

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## Introduction

Ramadan is a holy month for Muslims and fasting in this month is the rule for any healthy matured person. Ramadan fasting means abstention from eating, drinking, smoking and sexual activity from dawn to sunset.

Nutritional and behavioral changes occurred during Ramadan fasting may lead to several physiological change, such as blood pressure (1).

High blood pressure is the first leading global risks for mortality in the world (2). High systolic blood pressure attributed to globally 51% of stroke (cerebrovascular disease) and 45% of ischemic heart disease deaths (2).

One of the most important question for hypertensive patients and their physicians

before Ramadan is whether fasting is safe for them or not.

There are studies that evaluated the effect of Ramadan fasting on blood pressure in normotensive volunteers and explain some changes in systolic and diastolic blood pressures during Ramadan fasting and after that.

Most of the studies reported not change (3-5) or reduced systolic (6, 7) and diastolic blood pressures (7) during Ramadan.

Studies evaluated the effects of Ramadan fasting on blood pressure in hypertensive patients, are scarce and reported inadequate results.

Due to high prevalence of hypertension all over the world and the number of million

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Muslims that they are fasting every year, it seems necessary to evaluate the results of all the studies that reported the effects of Ramadan fasting on hypertensive patients.

In this paper a systematic review was performed to accumulate the results of published literature designed to evaluate the changes in blood pressure in hypertensive patients due to Ramadan fasting. Medline, Scopus and ISI databases were searched on the English articles published until September 2015. All searching procedures were performed by two independent researchers (MAN, MS) between July and October 2015.

## Material and methods

### Data sources and searches strategy

Medline, Scopus and ISI databases were searched on the English articles published until September 2015. All searching procedures were performed by two independent

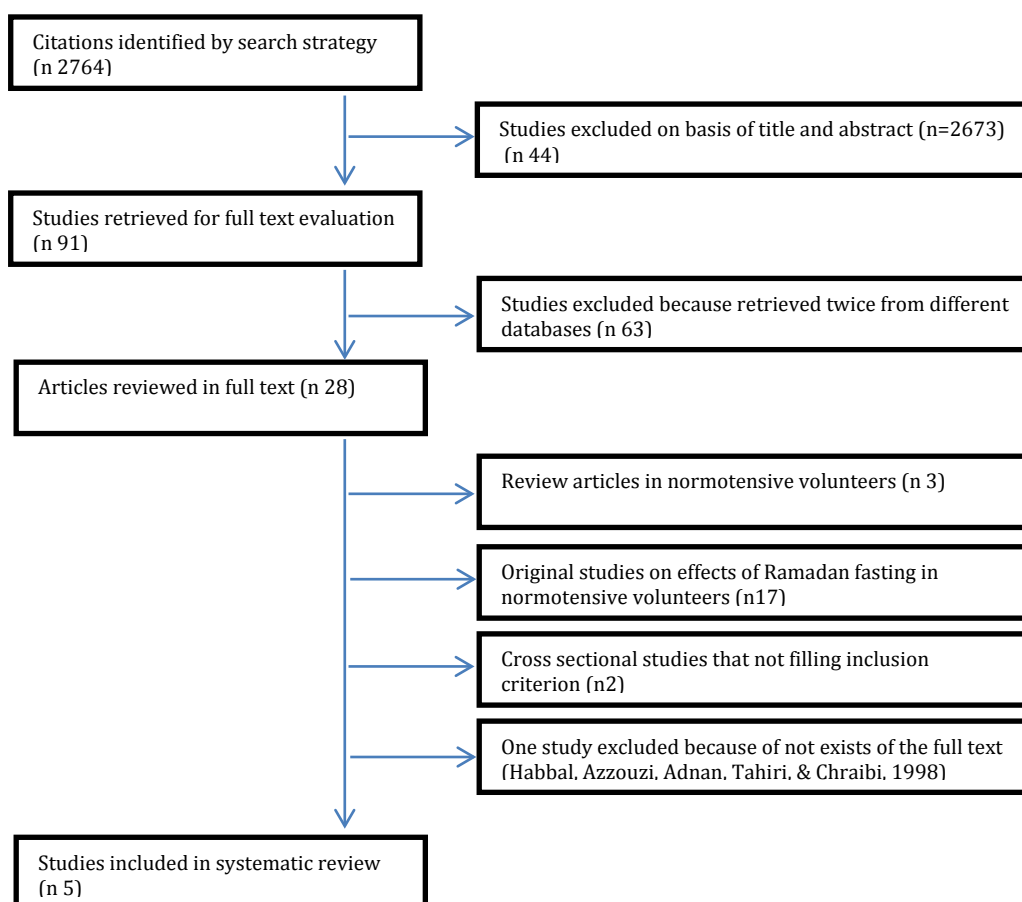
researchers (MAN, MS) between July and October 2015. Also, manual searching was done on the reference lists of the review and original articles.

The combination of key words in searches of ISI database, MEDLINE and SCOPUS were ("Ramadan" OR ("Islam\*" AND "fast\*")) AND ("blood pres\*" OR "cardiovasc\*" OR "health").

The Medical Subject Headings (MeSH terms used in MEDLINE search were (effects ramadan fasting) OR (ramadan fasting cardiovascular) OR (ramadan fasting health).

### Study selection

The study selection process is summarized in Figure 1. We read the titles and abstracts of all the searched studies and exclude clearly not relevant papers. Duplicated studies from different database were excluded and the full texts of remaining papers were evaluated about meeting the inclusion criteria.



**Figure 1.** Flowchart showing the selection of studies included in the present systematic review of Ramadan fasting effects on blood pressure in hypertensive patients

Extracted data were checked by 2 authors (MAN, MS) independently.

Selection criteria:

P= hypertensive patients: those with usual office blood pressure of at least 140/90 mm Hg (8)

I= fasting during Ramadan

C= with or without healthy control group (before and after studies)

O= any changes in systolic or diastolic blood pressure

All prospective, English studies which evaluated the effects of Ramadan fasting on blood pressure in hypertensive patients and measured systolic and diastolic blood pressure twice at least (before Ramadan and during last week of Ramadan or after Ramadan fasting) were included in systematic review.

Review articles, cross sectional studies, studies that conducted in normotensive volunteers, or measured blood pressure less than twice, were excluded from the systematic review.

**Data extraction**

The information of first author’s name, publication year, country in which the study was done (nationality), alteration in systolic and diastolic blood pressures, sample size and mean

age of the volunteers in retrieved studies were extracted in Table1.

**Results**

**Study selection**

Out of 2764 citations identified from three databases (Medline, Scopus and ISI), 2673 studies were excluded on basis of title and abstract (studies which searched from each database were evaluated separately).

In general, 91 papers were selected that 63 papers of them were duplicated. Twenty eight retrieved papers were collected and full texts of all of them were read to exclude not relevant studies. The full texts of relevant papers were evaluated about meeting the inclusion criteria. Original studies that were conducted in normotensive volunteers (n 17), cross sectional studies (n 2) and review articles in normotensive volunteers (n 3) were excluded from the review (Figure1).

We find just one review article that review 2 studies (9, 10) on effects of Ramadan fasting on blood pressure in hypertensive patients before 2001(11). Both of them were in our search result.

Another systematic review paper which review the impact of Ramadan fasting on

**Table 1.** Summary of studies included in the systematic review

Author & date	Country	subjects	gender	age	Systolic blood pressure			Diastolic blood pressure			conclusion
					Before Ramadan	After Ramadan (end of Ramadan)	2-3w After Ramadan	Before Ramadan	After Ramadan (end of Ramadan)	2-3w After Ramadan	
Salahuddin M et al (2014) (Salahuddin et al., 2014)	India	15 HTN	both	44.6±5.62	148±19.6	132.5±17.9*	-	90.4±7.8	81.1±6.3*	-	Significant reduction in SBP & DBP during Ramadan
Al-Shafei, et al (2014) (Al-Shafei, 2014)	Egypt 2012	40 HTN 40 Control	both	55±5 55±5	162±6.0 128±8.0	-10.5%* -6.3%	-6.2% -1.2%	104±5.0 85±6.0	-3.8% -1.5%	-6.7% -4.7%	Significant reduction in SBP during Ramadan
Akturk, I. F et al. (2013) (Akturk et al., 2013)	Turkey	20 HTN	10W 10M	52±14	140.34±17.1	129.26±10.58	136.30±17.61	82.10±10.8	77.33±8.08	83.23±11.44	Significant reduction in SBP & DBP during Ramadan
Perk, G et al (2001) (Perk et al., 2001)	-	17 HTN	2W 15M	56.6±6.9	138.5±18.5	136.4±20.4	-	77.2±8.1	75.7±5.9	-	Not significant difference
Ural, E et al (2008) (Ural et al., 2008)	-	45 HTN	30w 15m	58±12	127±15	128±17	-	75±8	76±11	-	Not significant difference
Research letter											
Habbal, R et al *(1998) (Habbal et al., 1998)	1994-1997	99 HTN	72W 27M	56.7±9	NA	NA	NA	NA	NA	NA	Not significant difference

\* One study excluded because of not exists of the full text

cardiovascular disease (12), accumulate the data from 3 papers in hypertensive patients (10, 13, 14). One of them was not met inclusion criteria about duration of measurements (14). Two other papers were existed in search result.

One study excluded because of not exists of the full text. We contact to the author and request the full text, but there was no answer from him (9).

### **Ramadan fasting and systolic blood pressure**

Although significant reduction in systolic blood pressure during Ramadan fasting were seen in 3 studies (13, 15, 16), other 2 studies reported no significant difference between systolic blood pressure before and after Ramadan fasting (10, 17) (Table 1).

### **Ramadan fasting and diastolic blood pressure**

Among 5 studies that reviewed in this paper, 3 studies reported no significant changes in diastolic blood pressure (10, 15, 17). Two other studies reported significant reduction in systolic blood pressure after Ramadan fasting (13, 16) (Table 1).

## **Discussion**

This systematic review suggested that Ramadan fasting can be safe in treated essential hypertensive patients with continuation of previous medications. Also it can improve systolic and diastolic blood pressures.

To the best of our knowledge, until the time of preparing the manuscripts for this systematic review, there wasn't any study that reported a significant increase in blood pressures in hypertensive patients. There was no report about hypertension crisis regard to Ramadan fasting.

All of the retrieved studies that included in this systematic review were conducted in established essential hypertensive patients under antihypertensive drug therapy.

One of them was done in hypertensive patients with once daily medication and reported no significant changes in average 24-hours blood pressure, average awake blood pressure and average sleep blood pressure before Ramadan fasting and during the last week of Ramadan (10). The interval of medication was not influenced by Ramadan fasting in this study, because of once daily

medication. It can be the cause of not significant alteration in blood pressures regard to Ramadan fasting.

The other studies (13,15-17) were conducted in patients with twice daily combination drug therapy.

Second study that reported no significant changes in mean 24-h ambulatory blood pressure, mean daytime and night time ambulatory blood pressures, measured blood pressure in the Ramadan for the first time and after Ramadan as second measurement (17).

this study was examined the effect of Ramadan fasting on ambulatory blood pressure in treated volunteers with grade 2-3 hypertension under combination drug therapy. There was no detail about the exact time of measurements in this paper (17).

Other 3 studies that were reviewed in this paper, reported significant reduction in systolic and/ or diastolic blood pressure during Ramadan fasting in hypertensive patients.

Al-Shafei, et al evaluated the effect of Ramadan fasting on blood pressure in hypertensive patients with established moderate essential hypertension (n 40), with a SBP of 150 – 180 mmHg and/or a DBP of 95 – 120 mmHg, use of two or fewer anti-hypertensive drugs and an absence of secondary hypertension or diabetes participated in the study. Volunteers in control group (n 40) were neither hypertensive nor diabetic. All hypertensive volunteers took their medications during Ramadan as their physicians advised them. Pre Ramadan SBP and DBP were significantly higher in hypertensive group. At the end of Ramadan fasting, SBP decreased significantly in hypertensive patients and insignificantly in control group. DBP reduction was insignificantly in both groups. In comparison of pre Ramadan measurements, post Ramadan SBP and DBP remained insignificantly lower in hypertensive and normotensive group (15).

Akturk study was conducted in well-controlled blood pressure patients and reported significant reduction in mean 24-h ambulatory blood pressure, mean daytime ambulatory blood pressure during Ramadan fasting. No significant difference was observed about night time ambulatory blood pressure (13).

Recent study that was done in 15 hypertensive patients, measured systolic and diastolic blood pressures by using

sphygmomanometers two or three times in every periods. This study reported significant reductions in both systolic and diastolic blood pressures after Ramadan fasting (16).

The full text of Habbal study that was selected 99 hypertensive patients from 1994 to 1997 was not existed. This study reported no significant difference between mean 24-h ambulatory blood pressures during Ramadan fasting and before this month (9). Although we contacted to the authors by three times request email, there was no answer about full text of this study.

## Conclusion

This systematic review suggested that Ramadan fasting can be safe in treated essential hypertensive patients with continuation of previous medications. Also it can improve systolic and diastolic blood pressures.

Hypertensive patients should consult by their physicians about Ramadan fasting and if it is possible, adapted the treatment schedule before the beginning of Ramadan.

Studies that evaluated the effect of Ramadan fasting on blood pressure in hypertensive patients are scarce. Further studies with larger sample size and considering the effects of other factors such as calorie intake, physical activity, weight changes, salt and carbohydrate consumption and dehydration is needed to explain the probable effect of Ramadan fasting on blood pressure in hypertensive patients.

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