

Cardiac emergencies among fasting people with diabetes during Ramadan — A prospective study from Pakistan

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ABSTRACT

Aims and objectives: To observe and compare the frequency of acute cardiac emergencies among fasting people with diabetes presenting before, during, and after Ramadan.

Methodology: This prospective observational study was conducted at the Tabba Heart Institute, Karachi, Pakistan, between May and August 2017. Data were collected using a predesigned, closed-ended questionnaire for people presented who acute cardiac events in the emergency department before, during, and after the month of Ramadan. During Ramadan, the fasting status of patients was also recorded.

Results: A total of 1036 people with cardiac emergencies presented in the emergency department during the study period. Of these, 525 (50.67%) had diabetes mellitus with a mean age of 60.42 ± 10.06 years. Heart failure was present in 37 (20.7%) people with diabetes and 25 (12%) people without diabetes before Ramadan. A total of 46 (28.6%) people with diabetes and 23 (15.6%) people without diabetes had heart failure during Ramadan. A non-significant higher frequency of acute myocardial infarction was noted among fasting people with diabetes.

Conclusion: In this study, the frequency of cardiac emergencies in people with diabetes during Ramadan was comparable before and after Ramadan. Heart failure was significantly more common among people with diabetes before and during Ramadan. Presentations with acute myocardial infarction and arrhythmias were more common outside Ramadan. No significant differences regarding acute events were found between fasting people with and without diabetes.

KEY WORDS: Ramadan fasting, Diabetes mellitus, Acute MI, Arrhythmia, Heart failure, Unstable angina.

INTRODUCTION

Ramadan, the ninth month of the Islamic calendar, is a period of fasting that can span from 29 to 30 days. During fasting, one must refrain from consuming water, food, oral medications, smoking, and sexual activity between sunrise and sunset. Depending on the season and geographical location, the typical fasting period during Ramadan can vary from 12 to 21 hours per day. People who observe Ramadan

eat two main meals during the 24-hour period: one before sunrise (suhor) and one after sunset (iftar). Every adult Muslim who is capable must observe fasting, except for those who may be harmed by fasting due to health reasons.¹ Even though there are valid exceptions from health and religious experts, many Muslims still feel a strong urge to fast during this month, even if they are considered high-risk due to chronic conditions like diabetes, hypertension, and old age.²

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Table-I: Demographic and clinical features of the study population.

Variables	Diabetes Mellitus (DM)				Non-Diabetes Mellitus (Non-DM)			
	Pre-Ramadan	Ramadan	Post-Ramadan	Overall	Pre-Ramadan	Ramadan	Post-Ramadan	Overall
n (%)	179	161	185	525	209	147	155	511
Age(years)	58.74±8.98	60.77±10.59	61.74±10.39	60.42±10.06	59.74±13.05	56.39±12.91	58.59±13.46	58.43±13.18
Gender								
Male	123(68.7)	96(59.6)	111(60)	330(62.9)	156(74.6)	111(75.5)	107(69)	374(73.2)
Female	56(31.3)	65(40.4)	74(40)	195(37.1)	53(25.4)	36(24.5)	48(31)	137(26.8)
SBP (mmHg)	134.64±25.48	141.39±26.1	134.78±27.01	136.77±26.34	129.36±22.44	129.48±25.03	130.64±27.38	129.77±24.68
DBP (mmHg)	77.76±12.8	79.4±13.67	77.51±13.09	78.18±13.17	76.67±13.03	75.59±13.07	77.39±16.46	76.57±14.12
Smoking history	23(12.8)	34(21.1)	44(23.8)	101(19.2)	54(25.8)	44(29.9)	42(27.1)	140(27.4)
Hypertensive	139(77.7)	123(76.4)	145(78.4)	407(77.5)	107(51.2)	74(50.3)	84(54.2)	265(51.9)
Dyslipidemia	10(5.6)	12(7.5)	8(4.3)	30(5.7)	7(3.3)	5(3.4)	3(1.9)	15(2.9)
CKD	21(11.7)	16(9.9)	10(5.4)	47(9)	6(2.9)	4(2.7)	3(1.9)	13(2.5)
ESRD	4(2.2)	0(0)	0(0)	4(0.8)	0(0)	2(1.4)	1(0.6)	3(0.6)
IHD	65(36.3)	65(40.4)	70(37.8)	200(38.1)	47(22.5)	33(22.4)	40(25.8)	120(23.5)
CVA	8(4.5)	8(5)	8(4.3)	24(4.6)	10(4.8)	5(3.4)	6(3.9)	21(4.1)

SBP: systolic blood pressure; DBP: diastolic blood pressure;
 CKD: chronic kidney disease; ESRD: end stage renal disease;
 IHD: ischemic heart disease; CVA: cerebral vascular accident;
 Data presented as n (%) or Mean±SD
 P-value<0.05 considered to be statistically significant.

People with diabetes are two to three times more prone to develop cardiovascular diseases (CVD) than people without diabetes, leading to significant mortality and morbidity.^{3,4} Fasting during Ramadan is a significant change in lifestyle; i.e., incorporating two meals into the daily caloric intake by altering medication schedules and shortening sleep time may have a significant impact on cardiovascular risk in patients with CVD during the lunar month.⁵

Limited studies are available on this subject. Most studies are observational and retrospective, conducted not specifically among people with diabetes.⁶⁻⁹ Previous studies have shown no significant change in the incidence of CVD events when compared outside Ramadan.^{10,11} Though comparative studies have not shown differences between months, the fasting status of individuals was not seen or documented. Therefore, this study was designed to address these questions, i.e., (1) whether the frequency of cardiac emergencies during Ramadan among people with diabetes is comparable to before and after the Ramadan period? (2) Are there differences in cardiac presentations during Ramadan between people with and without diabetes? (3) Are cardiac emergencies among people with and without diabetes related to fasting?

METHODOLOGY

This prospective observational study was conducted from May to August 2017 at the Tabba Heart Institute, a tertiary care cardiac center in Karachi, Pakistan. Ethical approval for this study was obtained from the Institutional Review Board (IRB) of the Tabba Heart Institute, Karachi, Pakistan (IRB# THI/IRB/10.7.2017). Data was collected from all patients admitted through the emergency department in the cardiology unit of Tabba Heart Institute. All inpatients who presented with an acute cardiac event at the time of presentation, regardless

of age, gender, or co-morbidities, were recruited after taking verbal informed consent. A pre-designed closed-ended questionnaire was used for data collection, which comprised patients' demographic profiles, including age, gender, blood pressure, risk factors such as smoking, hypertension, diabetes, chronic kidney disease, prior history of coronary artery disease, prior history of cerebral artery disease, and diagnosis at the time of presentation, including acute myocardial infarction (MI), unstable angina, heart failure, and arrhythmia before, during, and after the month of Ramadan. The status of fasting before and at the time of the cardiac event was also recorded during Ramadan.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS) version 20. Data was presented as mean $\pm$ SD or n (%). Analysis of variables was done using Student's t-test, the chi-square test, or the paired t-test, as appropriate. A p-value < 0.05 was considered to be statistically significant.

RESULTS

A total of 1036 people with cardiovascular diseases (CVDs) participated in this study. Of these, 525 (50.67%) had diabetes mellitus, with a mean age of 60.42 $\pm$ 10.06 years. Table-I displays the demographic and clinical features of the study participants. The demographic and clinical characteristics of the study population are shown in Table-I.

A total of 308 people with diabetes presented in the emergency department during the month of Ramadan. Of these, a total of 185 (60.1%) and 69 (22.45%) patients were diagnosed with acute MI and heart failure, respectively (see Table-II).

Six fasting people with diabetes and 48 fasting people without diabetes were seen in the emergency department during the month of Ramadan. Of these, acute MI was

Table-II: Comparison of cardiac events before, during, and after Ramadan.

Cardiac events	Pre-Ramadan				Ramadan				Post-Ramadan			
	Non-DM	DM	P-value	Overall	Non-DM	DM	P-value	Overall	Non-DM	DM	P-value	Overall
n (%)	209	179		388	147	161		308	155	185		340
Acute MI	152 (72.7)	129 (72.1)	0.895	281 (72.4)	94 (63.9)	91 (56.5)	0.1854	185 (60.1)	93 (60)	132 (71.4)	0.0269	225 (66.2)
Un-stable angina	4 (1.9)	7 (3.9)	0.235	11 (2.8)	15 (10.2)	12 (7.5)	0.4032	27 (8.8)	8 (5.2)	7 (3.8)	0.5324	15 (4.4)
Heart failure	25 (12)	37 (20.7)	0.0289	62 (16)	23 (15.6)	46 (28.6)	0.0063	69 (22.4)	26 (16.8)	39 (21.1)	0.3155	65 (19.1)
Arrhythmia	28 (13.4)	6 (3.4)	0.0005	34 (8.8)	15 (10.2)	12 (7.5)	0.4032	27 (8.8)	28 (18.1)	7 (3.8)	<0.0001	35 (10.3)

MI; myocardial infarction, DM: diabetes mellitus, Non-DM: without diabetes mellitus ;

Data presented as n (%); P-value < 0.05 is considered statistically significant.

documented in 5 (83.3%) fasting people with diabetes and 36 (75%) fasting people without diabetes (p -value = 0.65). Heart failure was recorded in 1 (16.7%) fasting person with diabetes and 5 (10.4%) fasting people without diabetes (p -value = 0.64) (see Table-III).

DISCUSSION

The current research showed no significant difference in the rates of acute cardiovascular events in individuals with diabetes during Ramadan compared to before and after the month. Heart failure was more frequent and significant among people with diabetes before and during Ramadan compared to people without diabetes. No differences in cardiac presentations were found among fasting people with or without diabetes.

In this study, acute MI among people with diabetes was common post-Ramadan. Our results are in line with a recent study that found a higher risk of AMI occurrence one month after Ramadan and observed a rise in mortality rates among individuals with diabetes.¹² Consuming high-calorie foods, skipping medication doses, being physically inactive, and experiencing sleep deprivation during Ramadan could lead to an exacerbation of cardiac events after Ramadan. A study found that there were fewer occurrences of MI in the fasting group from Turkey.⁷ Additionally, patients in Saudi Arabia who fasted had shorter hospital stays after MI compared to non-fasting patients, suggesting that fasting could potentially have a protective impact on AMI patients. However, a different study discovered greater rates of AMI in the fasting group compared to the non-fasting group. These results require additional scrutiny, as they conflict with the findings mentioned earlier.¹³

In this study, individuals with diabetes had a higher rate of heart failure before and during Ramadan. Increased incidences of heart failure during Ramadan may result from irregularities in diet, decreased intake, and failure to take prescribed medications. In contrast, another study found that patients with a past acute MI had a lower incidence of acute heart failure during Ramadan than in non-fasting months. Moreover, a slight and insignificant

rise in the rate of hospitalization for acute heart failure was observed in individuals with type 2 diabetes.⁸

Disturbances in cellular metabolism and ion channel function can lead to cardiac arrhythmias.¹⁴ We found a lower frequency of arrhythmias in our study population during the month of Ramadan compared to other periods. The frequency of arrhythmias was higher among people without diabetes before and after Ramadan periods. These results are similar to other studies that observed lower frequencies of atrial arrhythmias in patients hospitalized during Ramadan.^{15,16} This may be related to the beneficial effects of catecholamine inhibition that occur during fasting. Starvation is associated with catecholamine inhibition and decreased venous return, leading to decreased sympathetic tone, blood pressure, heart rate, and cardiac output.^{17,18}

We found only six people with diabetes were fasting on presentation, and no significant association with fasting was found. This has been shown in several studies that the majority of the studied population fasted safely for one month.^{10,19-21} One recent study showed that the majority of people with diabetes and coronary heart disease were able to fast during Ramadan without any significant change in CVD risk factors or hospitalization with CVD or diabetes-related conditions.²² Another systematic review and meta-analysis findings showed no significant difference in AMI-related outcomes among fasting patients compared to those who did not fast.¹¹ On the other hand, a multicenter study demonstrated that patients who undertook Ramadan fasting within 3 months of percutaneous coronary intervention had a higher incidence of significant cardiac events than those who did not undertake Ramadan fasting. Their findings suggest that most of the major adverse cardiac events occurred during Ramadan fasting due to dehydration and thrombosis.²³

The major strength of our study is that this is the first large-scale prospective study that shows the effect of Ramadan fasting on people with diabetes and cardiovascular diseases. Limitations of the study are that this is a single-center study, and the number of fasting people with diabetes is too small to draw generalizations.

Table-III: Comparison of cardiac events based on fasting status of people with diabetes at the time of presentation.

Cardiac events	Fasting			Non-fasting		
	Non-DM	DM	P-value	Non-DM	DM	P-value
N	48	6		99	155	
Acute MI	36(75%)	5(83.3%)	0.6539	58(58.6%)	86(55.5%)	0.6268
Unstable angina	4(8.3%)	0(0%)	0.4634	11(11.1%)	12(7.7%)	0.3564
Heart failure	5(10.4%)	1(16.7%)	0.6433	18(18.2%)	45(29%)	0.0519
Arrhythmia	3(6.2%)	0(0%)	0.5304	12(12.1%)	12(7.7%)	0.2416

MI; myocardial infarction, DM; diabetes mellitus, Non-DM; without diabetes mellitus

Data presented as n (%); P-value < 0.05 is considered statistically significant

CONCLUSION

In this prospective Ramadan study, the incidence of common cardiac emergencies was comparable among people with and without diabetes. Heart failure was significantly more common among people with diabetes, but it was not Ramadan specific. Although few people were fasting at the time of presentation, no differences were found between people with and without diabetes.

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Author's Contribution:

SY: Data interpretation, writing, and review the manuscript. **SA:** Data interpretation, writing, and review the manuscript. **YA:** Concept and design, interpretation of data, edit and review the manuscript.

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