Original Research Article

Ramadan and coronary artery disease

ABSTRACT

Background: Ramadan fasting is a religious obligation for Muslims, and data on the effects of fasting on cardiovascular disease are scarce. The aim of the study was to investigate the prevalence of acute coronary syndrome (ACS) in Moroccan patients during Ramadan.

METHODS: Prospective study conducted in a Cardiac Intensive Care Unit for three months each year from 2020 to 2022: Ramadan, the month before and the month after.

Results: A total of 267 patients were included in our study. The mean age of our patients was 62 +/- 12 years, predominately male with a sex ratio (h/f) of 2.03. The prevalence of ACS was 16% during Ramadan, 19.5% in the month before Ramadan, and 24% in the month after Ramadan. There was no significant association between Ramadan and an increase in acute coronary syndromes, but there was a significant association between delay in visits and more severe clinical presentation and coronary artery disease.

Conclusions: Compared with the month before and after, Ramadan was characterized by a lower incidence of ACS, but more severe clinical manifestations, with the most severe coronary artery disease.

Keywords : Fasting, Coronary heart disease, cardiovascular risk factors

BACKGROUND:

Ramadan is one of the five pillars of Islam where there is a big change in lifestyle especially food (1). Muslims observing the fast must not only abstain from eating and drinking, but also from taking oral medications, smoking, as well as receiving intravenous fluids and nutrients. Despite the fact that most clinicians worldwide treat Muslim patients, a clear data about the incidence of acute coronary syndromes (ACS) and fasting during Ramadan are lacking (2). Previous researches have shown that fasting during the month of Ramadan has beneficial effects on cardiovascular risk factors, however there are controversies (3).

The aim of our study is to investigate the influence of Ramadan on the prevalence of acute coronary syndrome among patients in the intensive care unit of our cardiology department

METHODS

We conducted a prospective cohort study including 267 patients admitted in the intensive unit care of the cardiology department , Our hospital provides inpatient and outpatient medical and surgical care for the residents and surroundings, and is the only tertiary care center in the district , making it ideal for population-based studies.

We included, after having their written consent, patients admitted for acute coronary syndrome who are able to fast during the holy month of Ramadan and excluded those who couldn't.

Data were collected from the clinical records written by physicians at the time of the patient's discharge,

according to predefined criteria for each data point. The age of presentation, gender, cardiovascular risk factor profiles (smoking status, hypertension, hypercholesterolemia, diabetes mellitus, and pre-existing CVD), were analyzed.
We included all patients admitted for acute coronary syndrome during 3 months of each year from 2020 to 2022; the month of Ramadan, the month before known as "Shaaban" and the month after known as "Shawal". We established a comparison between the three periods in terms of epidemiological, clinical, biological and mortality.

Acute coronary syndromes including myocardial infarction and unstable angina were defined according to the World Health Organization. The presence of diabetes mellitus and hypertension were determined by the documentation in the patient's previous or current medical record. The presence of hyperlipidemia was determined by the demonstration of a fasting cholesterol >5.2 mmol/L in the patient's medical record, or any history of treatment for hyperlipidemia by the patient's physician.

The data were coded and entered into a computer using the Statistical Packages for Social Sciences [SPSS], Data are expressed as mean ± standard deviation(SD) unless otherwise stated. Student t-test was used to ascertain the significance of differences between mean values of 2 continuous variables. Chi-square analysis was performed to test for differences in proportions of categorical variables between the 2 groups.

The work has been reported in line with the STROCCS criteria : Mathew G et Agha R, pour le groupe STROCSS. STROCSS 2021 : Renforcement de la notification des études de cohorte, transversales et cas-témoins en chirurgie. Journal international de chirurgie 2021;96:106165.

This work has a unique identifying number or registration ID: researchregistry8472

https://www.researchregistry.com/register-now#home/registrationdetails/6369168dd5fb7f002117fc15/

RESULTS

The total number of the patients was 267: 28.83% patients before Ramadan , 37.07% after Ramadan and 34% during Ramadan. The mean age was 62+/- 12,16 years , with a male predominance (67%) . The main risk factor during Ramadan was hypertension while in the other months the predominant risk factors were age and smoking.

The mean characteristics during Ramadan were an average age of 60 years with a Standard deviation SD of 14.142 , a sex ratio (H/F) of 0.57, an average blood pressure of 123/75mmHg and a median heart rate of 79bpm with no statistically significant difference between the periods (Table.1-2)

Subjects with 1 to 3 cardiovascular risk factors were significantly higher during Shawal than before and during Ramadan (Table 1). According to the results of multivariate analysis, time after Ramadan multiplied the risk of ACS by 1.8 (p=0.001). In subgroup analyses, dyslipidemia (OR = 2.5), coronary heredity (OR = 2.3), arterial hypertension (OR = 1.1), obesity (OR = 2.4) and cumulative 3 cardiovascular factors were significantly increased during Ramadan Risk (OR = 3.0). After Ramadan, this risk was significantly higher among smokers (OR: 2.0), those with hypertension (OR = 1.2), and those with a cumulative cardiovascular risk factor of 1 to 2 (OR: 5.2 and 2.5, respectively). (Table 2).

The prevalence of ACS was 16% during Ramadan, 19,5% the month before Ramadan, and 24% the month after Ramadan. As for the time of consulting, patients who seeked medical consultation after 24 hours of symptoms onset are 49.5% during Ramadan, 59.2% before and 50.6% after Ramadan ; while patients who consulted within 6 hours of symptom onset were respectively 22%, 23,5% 22% (Fig.2).

For the blood test: a renal failure was found in 44% of the patients during Ramadan versus 21,8% and 38,4 % before and after Ramadan, hypokalemia was found in 7,5 % in Ramadan vs 6,9% the month before and 5,5% after. No glycemic imbalance has been reported. There was no statically significant difference between the three groups (table 3)

As for the coronary lesions, During Ramadan there were 45,6 % of 3 vessel disease and 31% of left main artery , requiring surgical interventions. While there was more 1 vessel disease and two vessel disease in SHAWAL and SHAABAN (42,9 vs 47,9%) and (33,2 vs 22,9%) accessible to angioplasty**. (Fig 3)**

The intra hospital mortality was 23,8 % during Ramadan versus 57% and 19% before and after Ramadan, the main causes were the cardiogenic shock during Ramadan and arrhythmias outside of Ramadan (Fig.3).

DISCUSSION

Ramadan is the ninth month of the Islamic calendar where all muslims fast from dawn to sunset. During this month, there are several changes in food habits and less diet with a predominance of consumtion of sweet foods and carbohydrates (4). Eating at different time than usual can lead to different metabolic disorders ,(5)and lead to different cardiovascular disease (1), mainly heart failure , hypertension and coronary artery disease (6)It can also affect stable cardiac patients and lead to acute events(7),(8).

There are Only Few studies on the incidence of Acute coronary disease in Ramadan (9)A retrospective study was realised in the coronary care unit and emergency service of internal medicine of Ankara , Turkey during 3 months of each year : Ramadan, one month Before and one month after and during 7 years from 1991 to 1997. The aim of the study was to Compare the incidence of acute myocardial infarction and unstable angina in Ramadan; it concluded that ramadan fasting didn't increase acute coronary heart events (10). An other retrospective study made in Doha, Qatar including 20856 patients; aimed to investigate whether Ramadan fasting had a negative effect on the incidence of presentation with Acute coronary syndrome such as acute myocardial infarction (AMI) and unstable angina, and concluded as well that there was no significant difference during Ramadan when compared to before and after ramadan (9). In a Saudian Review for over 30 years That was undertaken to assess any alteration in the incidence of acute cardiac illness during Ramadan fasting; whether fasting during the month of Ramadan alters the clinical status of patients with stable cardiac disease and the impact of Ramadan fasting on cardiovascular risk factors. It concluded that Ramadan fasting was not associated with any change in incidence of acute cardiac illness and the majority of cardiac patients can fast without any difficulty (11) Another prospective study, performed in the emergency department of

Fattouma Bourguiba University Hospital of Monastir, Tunisia during the 3 months before, during and after Ramadan from 2012 to 2014, investigated the influence of Ramadan on the prevalence of acute coronary syndrome among chest pain patients. The mean results were that the coronary disease prevalence was 17% a month before Ramadan, 22% during Ramadan and 28% one month after Ramadan (2)These results were different than our study where ramadan was caracterised by a lower prevalence of hospitalisation for coronary syndrome, we suggest that this could be due to the fact that ramadan is a holy month where families get grouped and the time of breaking fast or "Iftar" is important, most patients may wait after "Iftar" to consult .In subgroups analysis, the period of Ramadan was associated with an amplification of risk in men aged more than 55 years and women older than 65 years and among subjects with hypertension (2), (12), According to the results of the multivariate analysis, the period of Ramadan was not associated with increase of risk of coronary disease whereas the risk doubled after Ramadan in all group (p = 0.001)(2).

Conclusions

We found no significant differences in the incidence of acute coronary disease during Ramadan when compared to one month before and one month after, during three consecutive years. However there was a Lower prevalence of hospitalization with a Delay of consultation and More severe clinical presentation and coronary lesions during ramadan. Thus, we need to educate the population on the risk of coronary artery disease during this wholy month where our eating habits are different and we underestimate our health problems.

List of abbreviations:

ACS: Acute coronary syndrome

CVD: Cardiovascular Disease

BPM: Beat per minute

SAP: Systolic arterial pressure

DAP: Diastolic arterial pressure

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Funding: none

No conflict of interest

Written Informed Consent obtained

	Before Ramadan n=99	During Ramadan	After Ramadan	P
Age : mean Years old	62,7(11,5)	60,89(14,7)	62,16 (10,5)	0,162
Sexe : n (%) Men(179)	77(77,8)	52(57,1)	46(25,5)	0,009

Women (88)	22(22,2)	39(42,9)	27(31)	
SAP : mean mmHg (%)	129,8(20,3)	125,8(24,2)	125,7(21,4)	0,830
DAP : mean mmHg (%)	77,98(12,5)	74,8(13,8)	74,29(11)	0,180
Cardiovascular factors : n (%)				
Hypertension	41(41,4)	45(49,5)	37(48,1)	0,496
Diabetes mellitus	32(32,3)	35(38,5)	37(48,1)	0,104
Dyslipidemia	4(4,1)	20(22)	13(16,9)	0,003
smoking	53(53,5)	38(41,8)	44(57,1)	0,105
coronary heredity	4(4)	18(19,8)	13(16,9)	0,003
Menopause	19 (19,2)	30(33)	20(26)	0,096
Obesity	4(4)	12(13,2)	5(6,5)	0,046
Number of associated cardiovascular factors : n (%)				
0	6 (60.0)	2 (20.0)	2 (20.0)	0.20
1	4 (14.8)	8 (29.6)	15 (55.6)	0.03
2	9 (20.5)	14 (31.8)	21 (47.7)	0.08
3	9 (18.4)	20 (40.8)	20 (40.8)	0.08
4	7 (24.1)	7 (24.1)	15 (51.7)	0.11
5 -6	5 (41.7)	4 (33.3)	3 (25.0)	0.78

Table 1 Characteristics of the population with a syndrome acute coronary during the 3 study periods.

Odds Ratio –[IC95%] – (P)

	Before Ramadan	During Ramadan	After Ramadan
Coronary artery syndrome	1	1,2-[0,4-3,6]-(0,07)	1,8-[0,6-5,4]-(0,01)
Dyslipidemia	1	2,5-[1,2-5,1]-(0,01)	1,5-[0,7-3,2]-(0,23)
Smoking	1	0,6-[0,3-1,4]-(0,07)	2-[1,7-3,0]-(0,04)
Hypertension	1	1,1-[0,7-1,9]-(0,60)	1,2-[0,7-2,8]-(0,40)
Obesity	1	2,4-[1,0-5,8]-(0,60)	1,0-[0,3-2,7]-(1,00)
Coronary heredity	1	2,3-[1,1-4,9]-(0,02)	1,5-[0,7-3,3]-(0,36)
Diabetes mellitus	1	0,9-[0,5-1,6]-(0,89)	1,8-[1,0-3,1]-(0,03)
Number of associated cardiovascular factors : n (%) 0		0.3 - [0.1-1.3] - (0.103)	0.3 - [0.1-1.3] - (0.103)

1		1.8 - [0.5-6.5] - (0.283)	5.2 - [1.6-16.8] - (0.006)
2		1.9 - [0.8-4.8] - (0.164)	2.5 - [1.1-5.9] - (0.037)
3		3.0 - [1.2-7.8] - (0.021)	1.9 - [0.8-4.8] - (0.155)
4		0.7 - [0.2-2.7] - (0.696)	1.8 - [0.7-5.5] - (0.330)
5 -6		1.4 - [0.3-7.9] - (0.676)	1.0 - [0.2-5.3] - (0.973)

Table 2 Multivariate analysis: effects of the periods of Ramadan and SHAWAL

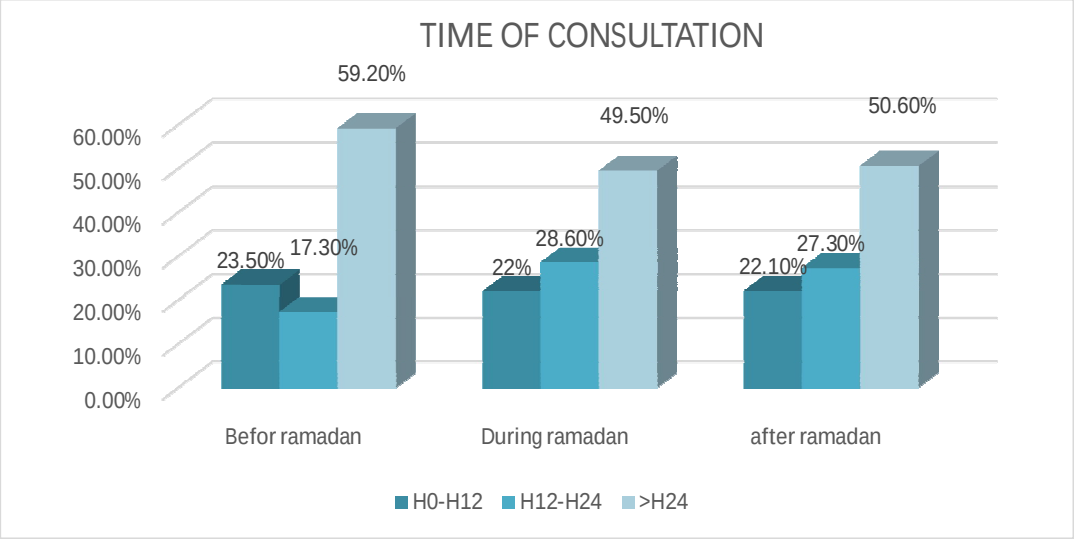

Figure 1 comparison of time o consultation according to periods

	Before Ramadan	**During Ramadan**	**After Ramadan**	**p**
Renal failure	21,8%	44,1%	38,4%	0,08
hyperglycemia	21,8%	29%	27,4%	0,20
hyponatremia	21,8%	33,3%	23,3%	0,30
hypokalemia	6,9%	7,5%	5,5%	0,40

Table 3 table comparing the main biological data according to the different periods

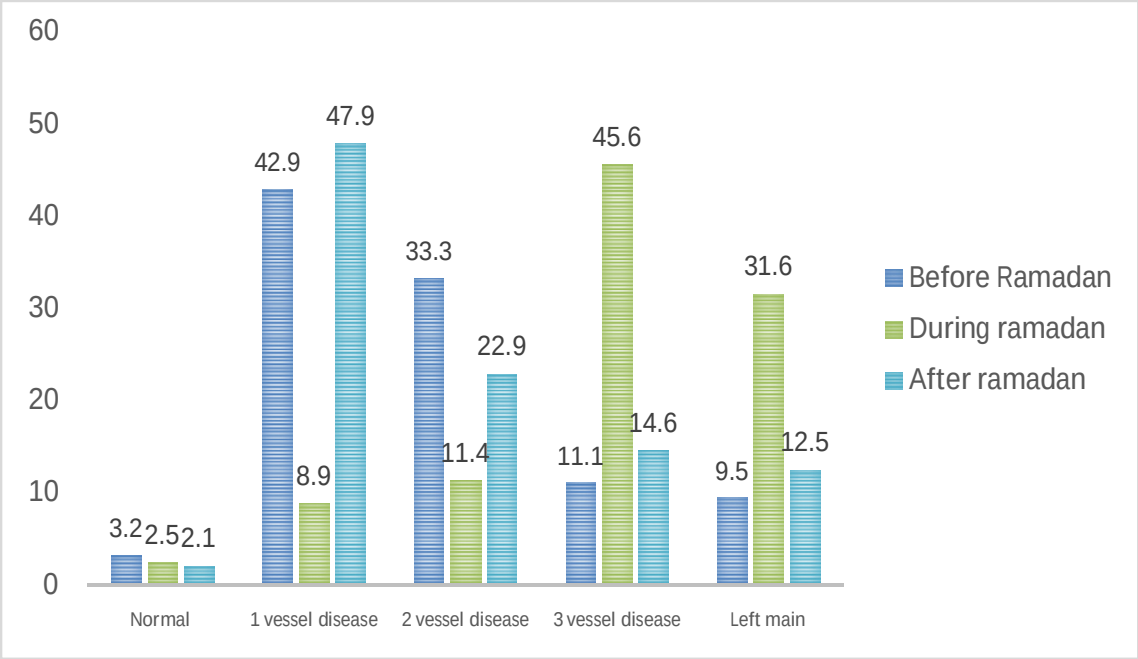

Figure 2 Different lesions found on coronary angiography according to the three periods

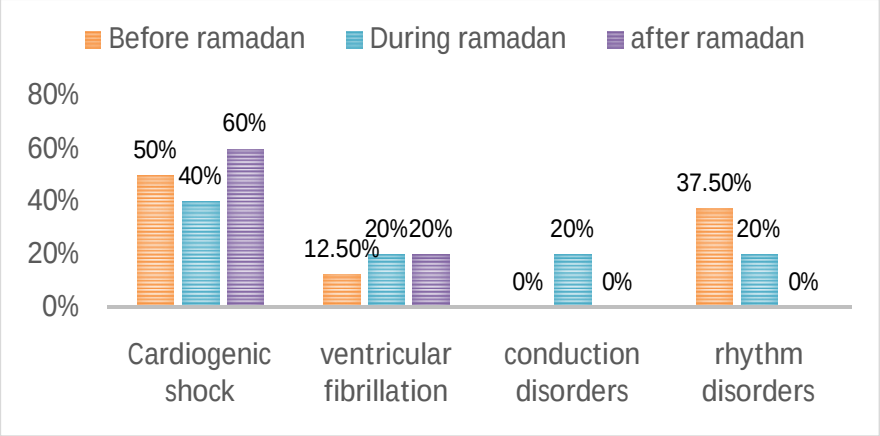

Figure 3 Different causes of cardiovascular death according to the three periods