



Hemodynamic Variations Associated with Ramadan Fasting among Saudi Stroke's Patients

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ABSTRACT

Background: It was reported that intermittent fasting has several health benefits. Therefore, the present study aimed to assess the hemodynamic variations associated with Ramadan fasting among Saudi Stroke patients. **Methodology:** Information referring to 61 stroke patients were retrospectively retrieved from King Khalid hospital, Hail, Northern Saudi Arabia. Data relating to patients attended during the period from April 2019 to June 2019. The sample involved two months (Shaban and Ramadan) a full coverage sample. **Results:** Out of 61 study subjects, 26 patients were fasting during stroke happening and 35 patients were non-fasting. Out of the 61 patients, 35 (57.4%) were females and 26 (42.6%) were males. With the fasting month, hypertension was co-occurrence in 23/49 (47%) fasting patients, hence, it occurred in 26/49 (53%) among non-fasting patients, the risk of hypertension during Ramadan compared to non-fasting month; the relative risk (RR) and 95% confidence interval (95% CI): RR (95%CI)=1.1908 (0.9374 to 1.5128). **Conclusion:** Ramadan Fasting has some beneficial effects influencing stroke including incidence and severity reduction. Stroke associated hemodynamic variants, which were more apparent among women, were perceived to decline during fasting.

Keywords: Stroke, Hypertension, Ramadan, fasting, Saudi Arabia

INTRODUCTION

Stroke represents the 2nd most frequent cause of death and the 3rd leading cause of disability Worldwide. The most common stroke's risk factor is hypertension. One of the most challenges in patients with stroke is the management of blood pressure, which necessitating accurate diagnosis and strict treatment targets [1]. Ischemic and hemorrhagic strokes (the most common types) usually associated with arterial hypertension as the most prominent risk factor. In patients with intracranial hemorrhagic stroke, acute hypertensive is the most observed response. It was reported that more than 70% and of patients with acute intracranial hemorrhage have systolic blood pressure above 140 mmHg at the time of presentation, and around 20% present with a systolic above 180 mmHg [2,3].

Ramadan is a holy month in which the fasting during whole day hours (for 29 or 30 days) is compulsory for all healthy Muslims each year. Occasionally sick persons or those with chronic illnesses are exempted from fasting [4,5]. The Ramadan is similar to intermittent fasting which is gaining high popularity as a form of weight loss. Ramadan practice is accompanied by diverse changes in circadian rhythm hormones due to changes in sleep and activity configurations.

These alterations are associated with the capricious production of hormones, such as growth hormone, leptin, ghrelin, insulin, adiponectin, prolactin, sex hormones, and cortisol [6].

Although some studies have assumed that late mealtime may elevate the risk of cardio-metabolic health, Ramadan fasting offers many health benefits including declining of cardio-metabolic risk of diverse disorders, such as oxidative stress, overweight, lipid disorders, pro-inflammatory markers and glycemic complaint [7]. Though there is a shred of positive evidence between Ramadan fasting and cardiovascular disease [8], there is a lack of evidence exploring the relationship between Ramadan fasting and stroke. Therefore, the present study aimed to assess the hemodynamic variations associated with Ramadan fasting among Saudi Stroke patients.

MATERIALS AND METHODS

Information referring to 61 stroke patients were retrospectively retrieved from King Khalid hospital, Hail, Northern Saudi Arabia. Data relating to patients attended during the period from April 2019 to June 2019. The sample involved two months (Shaban (non-fasting) and Ramadan (fasting)) a full coverage sample. Obtained data were arranged in a standard data-sheet, and then entered a computer software statistical package for social science (SPSS) for analysis. Besides the demographical data such as age and sex, the retried information included; Fasting, non-fasting, Hypertension, Previous Stroke, Cardiac dysrhythmia, Hart failure, Cigarette smoking, Stroke type, Stroke severity.

Statistical Analysis

Obtained data were analyzed using SPSS software. Frequencies, percentages, cross-tabulations, and statistical significance were obtained. A 95% confidence level was employed to obtain the Chi-square test, p-value <0.05 considered statistically significant.

Ethical Approval

Ethical approval was obtained from the Ethical Committee at the College of Medicine, University of Ha'il, Saudi Arabia. Ethical approval number: HREC 00135/CM-UOH.04/20. A written ethical agreement was also obtained from King Khalid hospital.

RESULTS

This study investigated 61 stroke patients, 31 during Ramadan's Month (Muslims' fasting month), and 30 during Shaaban's (non-fasting month). Out of 61 study subjects, 26 patients were fasting during stroke happening and 35 patients were non-fasting. Out of the 61 patients, 35 (57.4%) were females and 26 (42.6%) were males, their aging was ranging from 34 to 98 years with a mean age of 61 years, as shown in Figure 1. With the fasting month, hypertension was co-occurrence in 23/49 (47%) fasting patients, hence, it occurred in 26/49 (53%) among non-fasting patients, the risk of hypertension during Ramadan compared to non-fasting month; the relative risk (RR) and 95% confidence interval (95% CI): RR (95%CI)=1.1908 (0.9374 to 1.5128).

A history of the previous stroke was ascertained in 9/18 (50%) of the fasting patients and 9/18 (50%) of the non-fasting patients. The RR (95%CI)=0.791 (0.438 to 1.428), p=0.318. Cardiac dysrhythmia was identified in only one (100%) case of fasting patients. Heart failure was seen in 4/61 (6.5%), 2/4 (50%) among fasting, and 2/4 (50%) among non-fasting patients. Out of 7 smokers, 5/7 (71%) were among fasting individuals and only 2/35 (29%) were among non-fasting patients, as indicated in Table 1 and Figure 2.

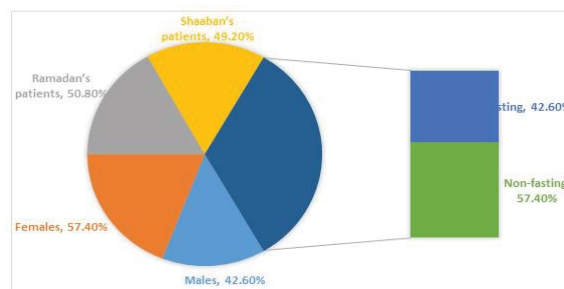


Figure 1 Description of the study population by patient's characteristics

Table 1 Hemodynamic disorders with stroke fasting status

Variable	Fasting	Non-fasting	Total	RR (95%CI)	p-value
Hypertension					
Yes	23	26	49	0.533 (0.191 to 1.4183)	0.1526
No	3	9	12		
Previous stroke					
Yes	9	9	18	0.791 (0.438 to 1.428)	0.318
No	17	26	33		
Cardiac dysrhythmia					
Yes	1	0	1	0	0.00
No	25	35	60		
Heart failure					
Yes	2	2	4	0.842 (0.302 to 2.350)	0.574
No	24	33	57		
Cigarette smoking					
Yes	5	2	7	0.544 (0.306 to 0.968)	0.11
No	21	33	54		

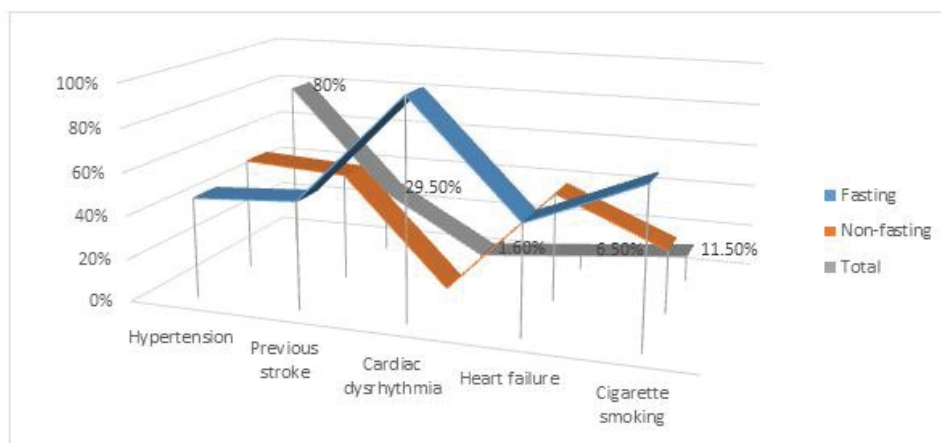


Figure 2 Description of the hemodynamic disorders with stroke fasting status

Table 2 Distribution of patients by stroke type and severity with fasting status

Variable	Category	Fasting	Non-fasting	Total
Stroke type	Hemorrhagic	1	0	1
	Ischemic	17	24	41
	Transient ischemic attack	8	11	19
	Total	26	35	61
Stroke severity	Minor (NIHSS1-4)	16	19	35
	Moderate (NISS5-15)	8	13	21
	Moderate to severe (NIHSS16-20)	2	3	5

Three types of stroke were identified, hemorrhagic was found in one fasting patient; ischemic was seen in 17/26 (65.4%) fasting patients and 24/35 (68.6%) non-fasting, the risk of ischemic stroke among non-fasting: Odd Ratio (OR) (95%CI)=1.1551 (0.3930 to 3.3946), p=0.7932; Transient ischemic attack was seen in 8/26 (30.8%) fasting patients and 11/35(31.4%) non-fasting, the risk of ischemic stroke among non-fasting: OR (95%CI)=1.0313 (0.3444 to 3.0881), p=0.9561, as indicated in Table 2 and Figure 3.

Stroke severity was evaluated according to the National Institutes of Health Stroke Scale (NIHSS). Minor severity strokes were identified in 16/26 (61.5%) fasting patients vs. 19/35 (54%) non-fasting, the risk of the minor stroke

with fasting, and the OR (95%CI)=1.3474 (0.4797 to 3.7844), p=0.5715. Moderate severity strokes were identified in 8/26 (30.7%) fasting patients vs. 13/35 (37%) non-fasting, the risk of moderate stroke with non-fasting, and the OR (95%CI)=1.3295 (0.4521 to 3.9103), p=0.6048. Minor severity strokes were identified in 2/26 (7.7%) fasting patients vs. 3/35 (8.6%) non-fasting, the risk of the minor stroke with non-fasting and the OR (95%CI)=1.1250 (0.1741 to 7.2692), p=0.9015, as indicated in Table 2 and Figure 3.

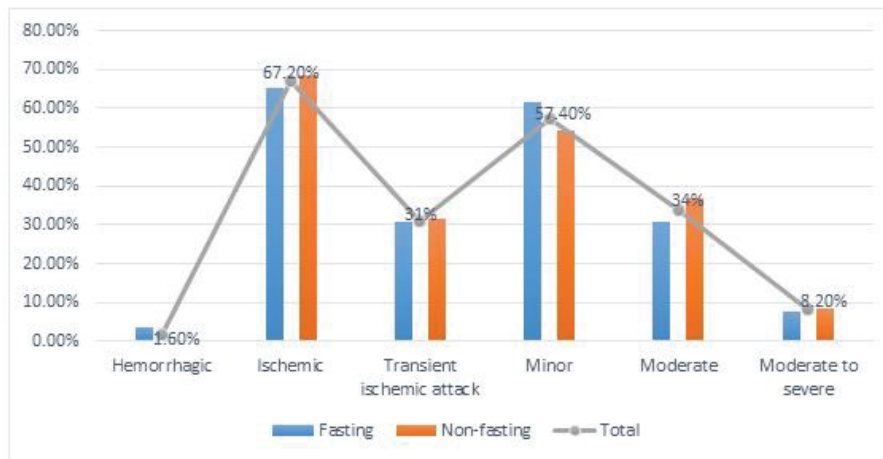


Figure 3 Patients by stroke type and severity with fasting status

In the present study stroke was more frequent among females 35/61 (57.4%) compared to males 26/61 (42.6%). Concerning hypertension, out of the 61 patients, 49/61 (80%) were hypertensive of whom 28/49 (57%) were females and the remaining 21/29 (43%) were males. The risk of hypertension among stroke’s patients associated with female’s sex was equal to OR (95%CI)=0.9524 (0.2649 to 3.4238), p=0.9404. History of stroke was revealed in 18 patients, of whom 8/18 (44.4%) were females and 10/18 (55.6%) were males. The risk of previous stroke among stroke’s patients associated with male’s sex was=OR (95%CI)=2.1094 (0.6906 to 6.4428), p=0.1901. A history of heart failure was revealed in 4 patients of whom three were males.

Out of 41 ischemic stroke cases, 22/41 (53.7%) were found among females and 19/41 (46.3%) were among males. The transient type was considered in 19 patients of whom 13/19 (68.4%) were females and 6/19 (31.6%) were males. The risk of transient stroke type among stroke’s patients associated with female’s sex was equal to OR (95%CI)=1.9697 (0.6292 to 6.1665), p=0.2443.

Minor stroke severity was encountered in 35 patients 21/35 (60%) were females and 14/35 (40%) males. Moderate was found in 21 patients (10 females and 11 males). Out of the 5 patients with severe conditions, 4 were females, as indicated in Table 3 and Figure 4.

Table 3 Hemodynamic disorders by sex

Variable	Females	Males	Total
Hypertension			
No	7	5	12
Yes	28	21	49
Total	35	26	61
Previous stroke			
No	27	16	43
Yes	8	10	18
Heart failure			
No	34	23	57

Yes	1	3	4
Stroke's type			
Hemorrhagic	0	1	1
Ischemic	22	19	41
Transient	13	6	19
Stroke's severity			
Minor	21	14	35
Moderate	10	11	21
Moderate to Severe	4	1	5

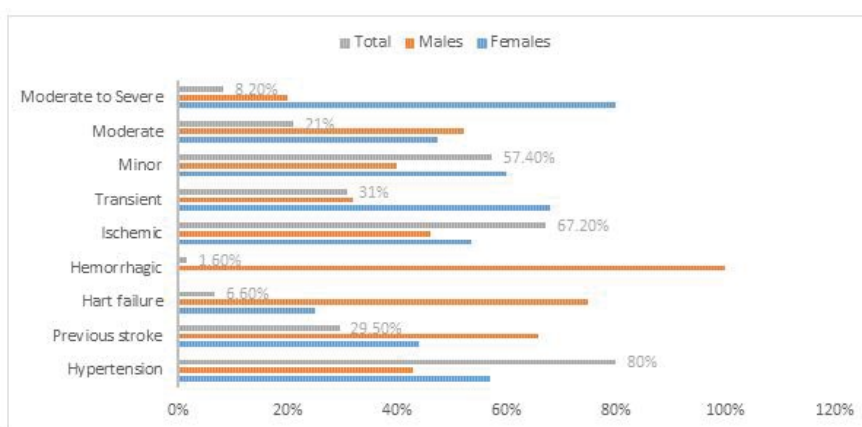


Figure 4 Description of patients by hemodynamic disorders and sex

The distribution of the hemodynamic changes by sex and fasting status was summarized in Table 4. Concerning hypertension, out of the 28 hypertensive females 18/28 (64%) were non-fasting and 10/28 (36%) during fasting, whereas, out of the 21 hypertensive males, 13/21 (62%) were during fasting month and 8/21 (38%) were during non-fasting. Stroke history was similarly found in both durations as well as both sex.

Table 4 Distribution of the hemodynamic changes by sex and fasting status

Category	Variable	Non-Fasting	Fasting	Total
Hypertension				
Females	No	5	2	7
	Yes	18	10	28
Males	No	4	1	5
	Yes	8	13	21
Previous stroke				
Females	No	19	8	27
	Yes	4	4	8
Males	No	7	9	16
	Yes	5	5	10
Heart Failure				
Females	No	23	11	34
	Yes	0	1	1

Males	No	10	13	23
	Yes	2	1	3
Cigarette smoking				
Females	No	23	12	35
	Yes	0	0	0
Males	No	10	9	19
	Yes	2	5	7

Table 5, summarized the distribution of the fasting status by sex, stroke type, and strokes' severity. Amongst 22 females with ischemic stroke, 14/22 (63.6%) were during the non-fasting month compared to 8/22 (36.4%) during the fasting month, on the other hand, amongst 19 men, (10 (52.6%) during non-fasting and 9 (47.4%) during fasting). Out of the 13 women with transient stroke, 9 (69%) during non-fasting and 4 (31%) during fasting, hence, of the 6 men, 4 (66.7%) were fasting and 2 (33.3%) were non-fasting.

Of the 21 women with minor stroke, 14 (66.7%) were non-fasting and 7 (33.3%) were fasting, whereas, of the 14 men, 9 (64%) were fasting and 5 (36%) were non-fasting. Moderate stroke severity was relatively similarly seen in both males and females.

Table 5 Distribution of the fasting status by sex, stroke's type and strokes' severity

Variable	Category	Non-Fasting	Fasting	Total
Stroke's types				
Females	Hemorrhagic	0	0	0
	Ischemic	14	8	22
	Transient	9	4	13
Males	Hemorrhagic	0	1	1
	Ischemic	10	9	19
	Transient	2	4	6
Stroke's severity				
Females	Minor	14	7	21
	Moderate	6	4	10
	Moderate to severe	3	1	4
Males	Minor	5	9	14
	Moderate	7	4	11
	Moderate to severe	0	1	1

The distribution of the study subjects by age and hemodynamic disorders was summarized in Table 6. Hypertension was significantly increased with an increase in age ($p < 0.05$). A history of the previous stroke was commonly seen in the age ranges 46-55 and 76+ years, representing 5/18 (27.8%) for each. Ischemic and transient stroke types were relatively similarly distributed among all age groups. Most of the minor stroke cases 13/35 (37%) were seen in the age group <45 years followed by 66-75 representing 7/35 (20%). Moderate stroke was increasingly seen in elder patients.

Table 6 Distribution of the study subjects by age and hemodynamic disorders

Variable	<45 years	46-55	56-65	66-75	76+	Total
Hypertension						
No	8	1	2	1	0	12

Yes	9	7	9	11	13	49
Total	17	8	11	12	13	61
Previous stroke						
No	15	3	9	8	8	43
Yes	2	5	2	4	5	18
Heart failure						
No	16	7	11	12	11	57
Yes	1	1	0	0	2	4
Stroke's type						
Hemorrhagic	1	0	0	0	0	1
Ischemic	11	5	6	9	10	41
Transient	5	3	5	3	3	19
Stroke's severity						
Minor	13	5	6	7	4	35
Moderate	2	2	5	4	8	21
Severe	2	1	0	1	1	5

DISCUSSION

In the present study stroke burden was assessed in two months (fasting month and non-fasting month). The current findings showing that the stroke was more frequent during the non-fasting month compared to the fasting month. These findings support many studies reporting a wide range of health beneficial effects of fasting. It was reported that intermittent fasting has several health benefits such as reducing inflammation, lowering blood pressure (the main causative of stroke), and decreasing the risk of a wide range of cardiovascular risk factors [9]. However, a study in this regard has shown that intra-individual fasting glucose variability during early adulthood is associated with cardiovascular disease [10].

The findings of the current study showing that stroke was more common among women compared to men. Although some studies showing that blood pressure during stroke [11] is the most prominent risk, some studies revealed the outnumber of men compared to women stroke patients [12].

In the present study, hypertension was co-occurrence in 47% fasting patients, compared to 53% non-fasting patients, the RR (95%CI)=1.1908 (0.9374 to 1.5128). Though the role of fasting preventive effect is weak here, it gives some indicators that require further future exploration employing a higher sample size. A previous history of stroke, cardiac dysrhythmia, and heart failure were similarly identified in both study groups. Though this condition status may have some impact in subsequent stroke status [13], the association and predictors of stroke in patients with these conditions still need more clarification.

Cigarette smoking is one of the most common risk factor enhancing the occurrence of stroke. The risk is not only increased among direct smokers but passive smokers [14]. Since around 70% of the smokers were among the fasting group, this further support the positive role of fasting in lowering the risk of stroke. In reference to stroke type, except for hemorrhagic (one case among fasting), all other types were more frequent among non-fasting patients compared to fasting. Moreover, decreased severity of stroke was frequently observed among fasting patients compared to non-fasting. With a lack of literature in this regard, a future multifarious search is necessary.

A history of stroke was more common among males compared to females in this study. However, this might be determined by several coexistent factors [15]. On the other hand, both ischemic stroke and transient stroke were more frequent among females. Due to the global aging of females, the prevalence of stroke among females is expected to witness rapid growth. The sex difference is greatly creating variability in the vascular risk factors in terms of clinical outcomes and prevalence indicating the importance of sex in stroke. For example, atrial fibrillation, diabetes, and pregnancy-associated hypertension are much influential in women [16]. Moreover, severe degrees of stroke were more apparent among females. It was well-established that stroke is responsible for serious consequences in females in terms of cost, disability, mortality [17]. Cerebrovascular disease with atypical symptoms is more likely to affect

women rather men [18]. Although there were some variations between males and females in fasting and non-fasting status, none of them has statistically considered value. However, such values may orient future research in this context.

Concerning age, most stroke-related factors were elevated with the increase of age. Some shows statistically significant differences, such as hypertension. Such findings were well-documented in the literature [19]. Although the present study has provided valuable information and appropriate clue for future research, it has some limitations including its retrospective setting and small sample size.

CONCLUSION

Ramadan Fasting has some beneficial effects influencing stroke including incidence and severity reduction. Stroke associated hemodynamic variants, which were more apparent among women, were perceived to decline during fasting. Further studies involving data from several medical centers can strengthen the findings of this study.

DECLARATIONS

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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