JOURNAL OF NUTRITION FASTING AND HEALTH

Effects of Ramadan Fasting on the Symptoms of Gastroesophageal Reflux Disease

Hojjatolah Rahimi[1*], Najmeh Tavakol[2]

1. Gastroenterologist, Poursina Hakim Digestive Diseases Research Center, Isfahan University of Medical Sciences, Isfahan, Iran
2. Poursina Hakim Digestive Diseases Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

ARTICLEINFO

Article type:
Research Paper

Article History:
Received: 14 Dec 2018
Accepted: 16 Feb 2019
Published: 11 Mar 2019

Keywords:
Ramadan Fasting
Gastroesophageal Reflux Disease
GERD

ABSTRACT

Introduction: The effects of Ramadan fasting on gastroesophageal reflux disease (GERD) remains unknown, and few studies have been conducted in this regard. The nutritional, physiological, psychological, and behavioral changes in fasting individuals during Ramadan may affect the status of GERD. The present study aimed to evaluate the effects of these changes on the symptoms of GERD using a meticulous method.

Methods: This study was conducted on patients with clinically diagnosed GERD by a gastroenterologist, who was followed-up for three consecutive months (from one month before to after Ramadan). Data were collected using GERD health-related quality of life (GERD-HRQL).For ethical considerations; antisecretory drugs were prescribed for all the patients. After data collection, the subjects were divided into two groups of fasting and non-fasting. Data analysis and comparison were performed in SPSS.

Results: total, 69 patients with GERD completed the follow-up, including 33 fasting and 36 non-fasting subjects. No significant differences were observed in the changes of the Total, Heartburn and Regurgitation scores between the Fasting and Non-fasting groups from before Ramadan to Ramadan, Ramasdan to after Ramadan and also before to after Ramadan (P>0.05).

Conclusion: According to the results, Ramadan fasting has no effects on the symptoms of GERD in the patients using antisecretory drugs during this month.

► *Please cite this paper as*:
Rahimi H, Tavakol N. Effects of Ramadan Fasting on the Symptoms of Gastroesophageal Reflux Disease. J Nutrition Fasting Health. 2018; 6(4): 213-219. DOI: 10.22038/jnfh.2019.36885.1161

Introduction

Muslims fast from dawn to sunset during the holy month of Ramadan, which is the ninth lunar month in the Islamic calendar. During this period, Muslims abstain from eating, drinking, smoking, and sexual activity for 12-16 hours per day depending on the season. Fasting individuals consume a meal before sunrise (Suhur), followed by another meal at sunset (Iftar). Fasting is obligatory for all healthy adult Muslims. Over 50% of Muslims fast every day or on specific days in Ramadan, while some individuals are not able to fast due to medical conditions (1). Among this population, many patients with gastroesophageal reflux disease (GERD) are willing to fast despite their disease and enquire about the effects of Ramadan fasting on their health.

GERD is an upper gastrointestinal disease, the symptoms of which are suggestive of gastric content reflux to the esophagus or its complications. The most common symptoms of GERD include pyrosis, regurgitation, and dysphagia. GERD is defined as the presence of a minimum of weekly heartburn and/or acid regurgitation. The prevalence of the disease has been estimated at 18.1-27.8% in North America, 8.8-25.9% in Europe, 2.5-7.8% in East Asia, 8.7-33.1% in the Middle East, 11.6% in Australia, and 23.0% in South America(2). The prevalence of GERD in Iran has been reported variably in different studies, with the mean prevalence estimated at 10-20%, which is similar to

* *Corresponding author:* Hojjatolah Rahimi, gastroenterologist, Poursina Hakim Digestive Diseases Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. Tel: 00983135548151-7; Email: hrahimi1390@gmail.com

western countries (3, 4).

Factors that are known to deteriorate GERD or its symptoms include obesity, reduced salivation, smoking habits, alcohol consumption, some medications, intake of large meals, and the psychological factors that heighten esophageal sensitivity (5-8).Ramadan fasting is associated with changes in diurnal intake and sleep patterns, which influence the physiology of the human body. During Ramadan, fasting individuals eat two meals at the approximate interval of 12-16hours.Among the other changes associated with Ramadan fasting are increased irritability, decreased drug compliance (9), and avoidance of smoking and alcohol consumption. Other changes in psychological factors during Ramadan may also influence the symptoms of GERD.

Few studies have been conducted in this regard, proposing variable, conflicting results. These studies have mainly been focused on healthy individuals rather than patients with GERD, and the findings have denoted the reduced, increased or unchanged status of heartburn and reflux episodes in fasting individuals during Ramadan (10-13).

The present study aimed to investigate the effects of Ramadan fasting on the severity of the symptoms of GERD using a meticulous method and assess the changes in the symptoms of patients with GERD from before to after Ramadan.

Material and methods

This longitudinal study was conducted based on consecutive sampling on patients with clinically diagnosed GERD by gastroenterologist referring to Poursina Hakim Clinic and a private gastroenterological office in Isfahan, Iran. The patients completed the study during three consecutive months of the Islamic calendar (Sha'ban, Ramadan, and Shaval) one month before, during, and one month after Ramadan, respectively, which corresponded to 28April-24July2017 and 18April-14July 2018.

The inclusion criterion of the study was adult patients with clinically diagnosed GERD by a gastroenterologist, and the exclusion criterion was patients aged less than 15 and more than90 years.

Data on the symptoms of GERD were collected using the validated version of self-administered GERD health-related quality of life (GERD-HRQL) during the follow-ups (14). GERD-HRQL consisted of15 items regarding heartburn, regurgitation, difficulty in swallowing, and effects of GERD on daily life. The items were scored based on a five-point Likert scale (No Symptoms=0, Incapacitating Symptom=5). In addition, the questionnaire had an item to assess the general satisfaction of patients on three scales of satisfied, neutral, and dissatisfied (score range: 1-3). Total score (15 items), score of heartburn (six items), and score of regurgitation (six items) were within the ranges of 0-75, 0-30, and 0-30, respectively.

After the referral of the patients to the researchers, explaining the research procedures, and obtaining informed consent, the questionnaires were completed by the patients during, one month before, and one month after Ramadan.

To determine the required sample size with95% confidence level and 80% test power, and with the assumption that the effects of fasting on the mean score of GERD symptoms in the fasting group was nine units compared to the non-fasting group to be considered statistically significant, the values were inserted into the following formula and calculated for 30 subjects. In total, 36 subjects in each group were considered with adding 20% sample loss.

$$n=\frac{(Z_{1-\frac{\alpha}{2}}+Z_{1-\beta})^2\times(S_1^2+S_2^2)}{d^2}=\frac{(1.96+0.84)^2\times(2\times12.5^2)}{9^2}=30$$

It is notable that based on the mentioned formula and scores ranges of the symptoms of GERD in GERD-HRQL (=75), and the probability that all the data had three standard deviations before and after the mean, the standard deviation of the GERD score was estimated at 12.5 using the following formula:

$$\sigma=\frac{R}{6}=\frac{75}{6}=12.5$$

After data collection, the patients were divided into two groups of fasting patients

with fasting duration of more than 10 days in Ramadan and non-fasting patients. Data analysis was performed in SPSS version 22 using descriptive and analytical statistics, as well as t-test, Chi-square, Fisher's exact test, Mann-Whitney U test, and Freedman test. In all the statistical analyses, P-value of less than 0.05 was considered significant.

Results

In total, 96 patients were enrolled in this study, with73 subjects referring for the first follow-up (before Ramadan) and 69 patients referring for the second follow-up (after Ramadan). Among 69 participants, 33 and 36 cases were divided into fasting and non-fasting groups, respectively. The baseline data of the patients with GERD before Ramadan and comparison of the study groups are presented in Table 1.

No significant differences were observed between the study groups in terms of age, gender, education level, smoking habits, underlying diseases, and use of antacids, antisecretory drugs, and other medications (P>0.05).To observed ethical considerations, antisecretory drugs were prescribed for all the patients after the first visit.

Table 1. Baseline Data of GERD Patients and Comparison of Fasting and Non-fasting Groups

Variable	Fasting (n=33)	Non-fasting (n=36)	*P-value*
Gender			
Male N (%)	12(36.4)	19(52.8)	0.17*
Female N (%)	21(63.6)	17(47.2)	
Age (year) Mean±SD	38.73±13.44	41.58±13.81	0.38#
Education Level			
High School Diploma or Below N (%)	23(69.7)	23(63.9)	0.60*
Above Diploma N (%)	10 (30.3)	13 (36.1)	
Smoking Habits			
Yes N (%)	1(3.0)	4(11.1)	0.35**
No N (%)	32(97.0)	32(88.9)	
Underlying Diseases			
Yes N (%)	15(45.5)	24(66.7)	0.076*
No N (%)	18(54.5)	12(33.3)	
Use of Antacids and Antisecretory Drugs			
Yes N (%)	25(75.8)	31(86.1)	0.27*
No N (%)	8(24.2)	5(13.9)	
Use of Other Medications			
Yes N (%)	22(66.7)	22(61.1)	0.63*
No N (%)	11(33.3)	14(38.9)	

*Chi-square test; **Fisher's exact test; #t-test

According to the findings, the total score of GERD significantly decreased in the fasting and non-fasting patients from before to after Ramadan (P<0.05). However, the differences between the two groups in the cross-sectional comparisons were not considered significant before and after Ramadan (P>0.05), while they were considered significant during Ramadan (P=0.047); the score in this regard was more in the non-fasting than fasting group (Table 2).

Table 2. Total GERD Score of Fasting and Non-fasting Groups

Group	Number	Before Ramadan (Mean±SD)	During Ramadan (Mean±SD)	After Ramadan (Mean±SD)	*P-value***
Fasting	33	17.15±15.47	9.88±13.56	9.91±13.31	<0.001
Non-fasting	36	21.42±13.26	14.08±13.10	13.46±12.99	0.012
P-value*	-	0.061	0.047	0.11	-

*Mann-Whitney U test; **Freedman test

The changes in the scores of total GERD, heartburn, and regurgitation scores from before to after Ramadan in the study groups are presented in Table 3. Although these scores decreased in both groups, their comparison showed no significant differences from before Ramadan to Ramadan, Ramadan to after Ramadan and also before to after Ramadan (P>0.05) (Table 3).

Table 3. Total GERD, Heartburn, and Regurgitation Score Changes in Fasting and Non-fasting Groups during Three Consecutive Months

Score	Score Changes	Fasting (Mean±SD)	Non-fasting (Mean±SD)	*P-value#*
Total GERD Score	R-BR*	-7.27±11.68	-7.33±15.51	0.80
	AR-BR**	-7.24±-11.97	-8.25±15.19	0.97
	AR-R***	0.03±3.40	-0.57±1.33	0.22
Heartburn Score	R-BR*	-3.54±7.01	-3.16±7.96	0.82
	AR-BR**	-3.63±6.99	-3.40±7.50	0.80
	AR-R***	-0.09±.52	-0.057±.99	0.65
Regurgitation Score	R-BR*	-2.51±6.10	-3.02±8.27	0.66
	AR-BR**	-2.36±6.39	-3.80±8.14	0.32
	AR-R***	-0.15±3.11	-0.57±1.46	0.41

*R-BR: mean sore during Ramadan minus mean score before Ramadan; **AR-BR: mean sore after Ramadan minus mean score before Ramadan; ***AR-R: mean sore after Ramadan minus mean score during Ramadan; #Mann-Whitney U test

Comparison of the study groups during the follow-ups, general satisfaction had no significant difference between the fasting and non-fasting individuals (P>0.05). It is notable that the satisfaction scores increased significantly (less satisfaction) during the follow-ups only in the non-fasting group (P=0.003) (Table 4).

Table 4. General Satisfaction in Fasting and Non-fasting Groups during Follow-ups

Group	Number	Before Ramadan (Mean±SD)	During Ramadan (Mean±SD)	After Ramadan (Mean±SD)	*P-value***
Fasting	33	1.33±0.73	1.64±0.65	1.61±0.65	0.22
Non-fasting	36	1.06±0.82	1.64±0.63	1.54±0.74	0.003
P-value*		0.15	0.98	0.82	

*Mann-Whitney U test; **Freedman test

Discussion

According to the results of the present study, the fasting and non-fasting groups had no significant differences in terms of the confounding factors, including age, gender, education level, smoking habits, underlying diseases, and use of antisecretory and other drugs; these factors may affect the symptoms of GERD (5-8). Among the mentioned confounders, use of antacids and the antisecretory drugs, such as H_2 blockers (e.g., ranitidine and famotidine) and proton-pump inhibitors (e.g., omeprazole and pantoprazole) play a key role in improving the symptoms of GERD. These drugs have long been used for the management of GERD and have proven effective in improving the symptoms of this disease (15-17).

For ethical considerations in the present study, antisecretory agents were prescribed for all the patients, which might have led to the significant reduction in the symptoms of GERD in the fasting and non-fasting individuals during the three-month follow-up. Considering that the fasting and non-fasting patients were similar in terms of the use of antisecretory agents, no significant differences were observed between the groups regarding the decreased symptoms of GERD, including heartburn and regurgitation. Therefore, it could be inferred that Ramadan fasting had no effects on the symptoms of GERD in the patients administered with antisecretory drugs during Ramadan.

Various findings have been proposed in a number of international studies in this regard. According to a research, healthy individuals might experience minor gastrointestinal symptoms in Ramadan fasting, such as heartburn (5.3%), belching, bloating, fullness sensation, mouth dryness and bitter taste in the mouth (18.7%), epigastric pain and discomfort (11.7%), and nausea and vomiting (4%), while no severe complications have been reported (10). The mentioned study was performed on healthy volunteers with no control group. In another cross-sectional study conducted in Indonesia, fasting patients experienced less severe GERD symptoms compared to non-fasting patients during Ramadan, as well as another normal month (11). However, the aforementioned study had some limitations in the methodology, including the lack of control groups in the follow-up, absence of data prior to Ramadan, not using valid questionnaires, and lack of data on the consumption of antacids or antisecretory drugs by the patients.

In an observational study aiming to evaluate the nutrition status of fasting individuals, all the Ramadan-related complications (e.g., heartburn) were reported to increase in fasting subjects compared to non-fasting subjects (12).In addition, the fasting subjects with heartburn had higher fat intake (≥45 g) and calorie intake (≥1500 kcal) in each meal. Heartburn was also assessed in all the individuals as a general symptom, not only in the patients with GERD patients, while the applied questionnaire was not valid.

Another research in this regard was performed on 22 male fasting subjects, and the results indicated the insignificant increased in the total prevalence of laryngopharyngeal reflux disease in fasting subjects compared to non-fasting subjects (50%versus 32%; P=0.361). However, the fasting subjects had significantly higher rates of throat clearing, postnasal drips, and globus sensation (13).

This study had some limitations, including the small sample size, relying only on reflux laryngeal findings, and lack of data on the consumption of antacids and antisecretory drugs by the patients.

The factors that may deteriorate the symptoms of GERD during Ramadan include increased acid secretion, large meal intake in each meal by some fasting individuals, increased irritability, and drug incompliance. A few studies have also demonstrated that the incidence of gastrin, pepsin, and acid secretion increased by 22-59% on day 10 of Ramadan, while it returned to the baseline levels one month after Ramadan (18-20).Moreover, irritability has been reported to increase and drug compliance has been reported to decrease during Ramadan, which may lead to increased esophageal hypersensitivity and ineffectiveness of antisecretory drugs, respectively (9).

On the other hand, stopping smoking and alcohol consumption as the aggravating factors of GERD during Ramadan (6, 21) may improve the symptoms of GERD. Another research in this regard was performed on 22 male fasting subjects….. postnasal drips, and globus sensation, consistent trigger of transient lower esophageal sphincter relaxation which plays a pivotal role in the Pathophysiology of GERD (22). Numerous fasting individuals also experience decreased meal frequency (2.2±0.3 versus 4.3±0.4) and energy intake during Ramadan (1488±118 versus 1823±262 kcal/d), which in turn leads to significant weight loss (3.12 kg) (23). However, some studies have indicated that weight loss during Ramadan is rare and varies within the range of0.1-1.4 kilograms (24). Due to decreased food intake and empty stomach during the day for 12-16hours, fasting individuals experience lower gastric distention, which prevents the occurrence of GERD.

Other changes in psycho-socio-spiritual factors during Ramadan may influence the symptoms of GERD. According to the previous findings in this regard, fasting led to the promotion of overall psychological wellbeing, self-acceptance, autonomy, positive relations, environmental mastery, and personal growth in the students who fasted during Ramadan (25). These psychological factors may affect esophageal hypersensitivity and symptoms of GERD.

In the present study, the general satisfaction of fasting patients had no changes before to after Ramadan, whereas non-fasting patients were less satisfied over time. However, the summation of the aforementioned factors is unpredictable, and our findings indicated that if patients with GERD use antisecretory drugs

during Ramadan, their symptoms are likely to improve. Further studies are required in order to confirm our findings.

Our study yielded more potent results due to its longitudinal design and use of consecutive sampling, as well as the recording of the data and follow-up of the GERD patients (both fasting and non-fasting)from one month before until one month after Ramadan.

Conclusion

According to the results, Ramadan fasting had no effects on the symptoms of GERD in the patients administered with antisecretory drugs during this month.

Acknowledgments

Hereby, we extend our gratitude to Poursina Hakim Research Center in Isfahan, Iran for the financial support of this study. We would also like to thank the participants for assisting us in this research project.

Conflict of interest

None declared.

References

1. Oztec Z, BagciT. Effects of fasting Ramadan on compliance with medical treatment. Ann Saudi Med. 1998; 18(5): 479-81.
2. El-Serag HB, Sweet S, Winchester CC, Dent J. Update on the epidemiology of gastro-oesophageal reflux disease: a systematic review. Gut. 2014; 63(6): 871-80.
3. Fazel M, Hassanzadeh Keshteli A, Jahangiri P, Daneshpajouhnejad P, Adibi P. Gastroesophageal Reflux Disease in Iran: SEPAHAN Systematic Review No. 2. Int J Prev Med. 2012; 3(Suppl 1): S10-S17.
4. Delavari A, Moradi G, Birjandi F, Elahi E, Saberifiroozi M. The Prevalence of Gastroesophageal Reflux Disease (GERD) in the Islamic Republic of Iran: A Systematic Review. Middle East J Dig Dis. 2012; 4(1): 5-15.
5. Pandolfino JE, El-Serag HB, Zhang Q, Shah N, Ghosh SK, Kahrilas PJ. Obesity: a challenge to esophagogastric junction integrity. Gastroenterology. 2006; 130(3): 639-49.
6. El-Serag HB, Ergun GA, Pandolfino J, Fitzgerald S, Tran T, Kramer JR. Obesity increases oesophageal acid exposure. Gut. 2007; 56(6): 749-55.
7. Kahrilas PJ, Gupta RR. The effect of cigarette smoking on salivation and esophageal acid clearance. J Lab Clin Med. 1989; 114(4): 431-8.
8. Rodriguez-Stanley S, Robinson M, Earnest DL, Greenwood-Van Meerveld B, Miner PB Jr. Esophageal hypersensitivity may be a major cause of heartburn. Am J Gastroenterol. 1999; 94(3): 628-31.
9. Kadri N, Tilane A, El Batal M, Taltit Y, Tahiri SM, Moussaoui D. Irritability during the month of Ramadan. Psychosom Med. 2000; 62(2): 280-5.
10. Darvish Moghadam S. Relative frequency of minor digestive symptoms in healthy fasting Muslims and their relation to dietary pattern. Medical Journal of Mashhad University of Medical Sciences. 2002; 45(75): 56-66.
11. Mardhiyah R, Makmun D, Syam AF, Setiati S. The Effects of Ramadhan Fasting on Clinical Symptoms in Patients with Gastroesophageal Reflux Disease. Acta Med Indones. 2016; 48(3): 169-74.
12. Shadman Z, Akhoundan M, Poorsoltan N, Khoshniat Nikoo M, Larijani B, Akhgar Zhand C, et al. Nutritional Education Needs in Relation to Ramadan Fasting and Its Complications in Tehran, Iran. Iran Red Crescent Med J. 2016; 18(8): e26130.
13. Hamdan AL, Nassar J, Dowli A, Al Zaghal Z, Sabri A. Effect of fasting on laryngopharyngeal reflux disease in male subjects. Eur Arch Otorhinolaryngol. 2012; 269(11): 2361-6.
14. Velanovich V. The development of the GERD-HRQL symptom severity instrument. Dis Esophagus 2007; 20(2):130-4.
15. Sontag SJ. The medical management of reflux esophagitis. Role of antacids and acid inhibition. Gastroenterol Clin North Am. 1990; 19(3): 683-712.
16. Sabesin SM, Berlin RG, Humphries TJ, Bradstreet DC, Walton-Bowen KL, Zaidi S. Famotidine relieves symptoms of gastroesophageal reflux disease and heals erosions and ulcerations. Results of a multicenter, placebo-controlled, dose-ranging study. USA Merck Gastroesophageal Reflux Disease Study Group. Arch Intern Med. 1991; 151(12): 2394-400.
17. Kellerman R, Kintanar T. Gastroesophageal reflux disease. Prim Care. 2017; 44(4): 561-73.
18. Hakkou F, Tazi A, Iraqui L, Celice-Pingaud C, Vatier J. The observance of Ramadan and its repercussion on gastric secretion. Gastroenterol Clin Biol. 1994; 18(3): 190-4.
19. Iraki L, Bogdan A, Hakkou F, Amrani N, Abkari A, Touitou Y. Ramadan diet restrictions modify the circadian time structure in humans. A study on plasma gastrin, insulin, glucose, and calcium and on gastric pH. J Clin Endocrinol Metab. 1997; 82(4): 1261-73.
20. Iraki L, Abkari A, Vallot T, Amrani N, Khlifa RH, Jellouli K, et al. Effect of Ramadan fasting on intragastric pH recorded during 24 hours in healthy subjects. Gastroenterol Clin Biol. 1997; 21(11): 813-9.
21. Pan J, Cen L, Chen W, Yu C, Li Y, Shen Z. Alcohol Consumption and the Risk of Gastroesophageal Reflux Disease: A Systematic Review and Meta-analysis. Alcohol Alcohol. 2019; 54(1) 62-9.
22. Martin CJ, Patrikios J, Dent J. Abolition of gas reflux and transient lower esophageal sphincter

relaxation by vagal blockade in the dog. Gastroenterology. 1986; 91(4): 890-6.
23. Khaled BM, Belbraouet S. Effect of Ramadan fasting on anthropometric parameters and food consumption in 276 type 2 diabetic obese women. Int J Diabetes Dev Ctries. 2009; 29(2): 62-8.
24. Mosek A, Korczyn AD. Fasting headache, weight loss, and dehydration. Headache. 1999; 39(3): 225-7.
25. Bayani AA, Esmaeili R, Ganji G. The Impact of Fasting on the Psychological Well-Being of Muslim Graduate Students. J Relig Health. 2018 Dec 6. [Epub ahead of print]