

Is long-term hunger (Ramadan model) a risk factor for acute appendicitis?

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ABSTRACT

الأهداف: التحقق في ما إذا كان الجوع على المدى الطويل ومتغيرات الروتين الطبيعي في هذه الفترة يشكل عامل خطر في الإصابة بالتهاب الزائدة الحادة على نموذج صوم رمضان في هذه الدراسة.

الطريقة: أجريت هذه الدراسة الوصفية في مستشفيين مختلفين مستشفى حيدر باسا نعمان و مركز الأبحاث - اسطنبول و مستشفى ولاية كارس - كارس - تركيا خلال الفترة ما بين 2004م و ديسمبر 2007م. تم تصنيف البيانات التي تم الحصول عليها من المرضى وفقاً للعمر، و نوع الجنس، و مجموعة العمر، والصفات المرضية للزائدة الدودية. تمت مقارنة البيانات التي تم الحصول عليها خلال فترة صيام رمضان مع الفترتين قبل وبعد رمضان.

النتائج: تلقى عدد 992 من بين 4288 مريض الذين تلقوا تشخيص التهاب الزائدة الحادة خلال 4 سنوات تم تشخيصهم خلال هذه الفترات الثلاثة. خضع 368 (37.1%)، و 318 (32.1%)، و 306 (30.8%) من هؤلاء المرضى للعملية الجراحية في الفترة ما قبل الصيام وأثناء الصيام و بعد الصيام. لم يكن هنالك فرقاً ملحوظاً من ناحية التكرار بالنسبة للعمر، و مجموعة العمر، و نوع الجنس ($p>0.05$).

خاتمة: هنالك تغيرات في الروتينات الغذائية خلال فترة صيام رمضان نتيجة لطول فترة الجوع، تم رؤية محدودية في تناول السوائل و الطعام. لقد اكتشفنا أن هذه التغيرات لم تكون عوامل خطر لتشكيل التهاب الزائدة الحادة كنتيجة دراستنا.

Objectives: To investigate whether long-term hunger and the changes in nutritional routines during Ramadan constitute risk factors in acute appendicitis on the model of Ramadan fasting in this study.

Methods: This retrospective study was carried out in 2 different hospitals (Istanbul Haydarpaşa Numune Training and Research Hospital and Kars State Hospital, Kars, Turkey) between January 2004 and December 2007. The data obtained from the patients

were classified according to age, gender, age group, and pathological characteristics of the appendix. The data obtained during the Ramadan fasting period was compared with the periods before and after.

Results: Nine hundred and ninety-two of the 4288 patients who received a diagnosis of acute appendicitis during the 4 years received their diagnosis during the 3 periods. Three hundred sixty-eight (37.1%) patients underwent surgery before Ramadan, 318 (32.1%) during, and 306 (30.8%) after. No significant difference was observed in terms of perforated and non-perforated AA frequency, age, age group, and gender ($p>0.05$).

Conclusion: There are changes in the nutritional routines during the Ramadan fasting period due to long-term hunger; and limitations were seen in the fluid and food intake. We detected that these changes did not constitute risk factors for acute appendicitis formation as a result of our study.

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Every year, millions of Muslims all around the world fast by staying hungry from sunrise until sunset for 29-30 days. This situation is considered by some authors as an appropriate model for investigating the effects of long-term hunger on the human body.¹ Changes occurring in the way of life and nutritional routines during the Ramadan may cause changes in metabolism.²⁻⁴ Effects of this situation on certain diseases that are affected by the changes in the

nutritional routines, such as diabetes mellitus,^{5,6} acute cholecystitis,⁷ cardiovascular disorder,⁸ and peptic ulcer,⁹ were evaluated in many studies. Acute appendicitis is one of the most frequently observed abdominal diseases in surgery clinics. It usually develops as a result of the obstruction of the appendix lumen. The most frequent causes are lymphoid follicular hyperplasia, fecalith, foreign bodies, or parasites.¹⁰ If untreated, it causes perforation and results in morbidity and mortality. The most frequently used treatment method is surgery. Although it was reported that the nutritional preferences and reduction in fluid intake are effective in appendicitis development,^{11,12} the effects of the changes observed in nutritional routines in this period on the frequency of appendicitis have not been investigated. Our objective in this study was to investigate the effects of Ramadan fasting on appendicitis frequency by comparing the frequency of the appendicitis cases before and after the month of Ramadan and during the Ramadan fasting in Turkey where more than 99% of the population is Muslim and at least 70% of them regularly fast during Ramadan.¹³

Methods. Following the approval of the study protocol by the ethics committee of Faculty of Medicine, Kafkas University, Kars, Turkey, we retrospectively evaluated a total of 4288 patients who received a diagnosis of appendicitis between January 2004 and December 2007 at the Istanbul Haydarpaşa Numune Education and Research Hospital and Kars State Hospital, Kars, Turkey. These hospitals are in such locations where the population is composed of younger natives from the middle socio-economic class. We used patients' files, surgery records, records of the surgery clinics, and the ICD-10 (K35, K35.0) codes, which are international codes of the patients, in the evaluation process. Our periods before and after the Ramadan consisted of the same number of days present in the Ramadan month according to the Gregorian calendar. All patients who were considered with acute appendicitis as a result of the physician's examination and radiological investigations (abdominal ultrasonography, computed tomography) underwent surgery. The patients who received a diagnosis of acute appendicitis by the surgeon during the surgery and subsequent pathological evaluation were included in the study. The patients with normal appendix, pregnancy and child patients under the minimum age (>10 age) required for fasting during Ramadan were not included in the study (Figure 1). The patients were classified according to their age, gender, and pathology characteristics (perforated, non-perforated). They were divided into 4 age groups as <20, 20-40, 41-60 and >61 years. Cases observed during the periods before and after the Ramadan were compared with the cases observed during the Ramadan.

We used Statistical Package for Social Science Version 15.0 for data analysis (SPSS, Inc., Chicago, IL, USA). We compared the data using the Chi-square test and evaluated 95% confidence interval. A *p*-value less than 0.05 was considered statistically significant.

Results. A final diagnosis of acute appendicitis was made according to the surgical findings and pathological examination in 4288 (97.1%) of 4418 patients who were operated between January 2004 and December 2007 with a preliminary diagnosis of acute appendicitis. We found that 992 (23.1%) of these operations were performed during the 3 consecutive periods (before the Ramadan, during the Ramadan, and after the Ramadan). Six hundred and two (60.7%) of these patients were male, 390 were female, and the mean age was 28.41±14.30 (range, 10-83 years). Median age male 27.93±13.82 years (range, 10-82 years); female 29.14±14.99 years (range, 10-83 years). Three hundred and sixty-eight (37.1%), 318 (32.1%), and 306 (30.8%) of these patients underwent surgery during the period before the Ramadan, during the Ramadan month, and after the Ramadan respectively (*p*>0.05). The number of patients with perforation in these 3 periods was 26 (34.2%), 26 (34.2%), and 24 (31.6%) respectively. There was no significant difference between these periods in terms of the frequency of perforation observed (*p*>0.05). No significant difference was detected between the males and the females based on the periods before and after the Ramadan (*p*>0.05). No significant difference was

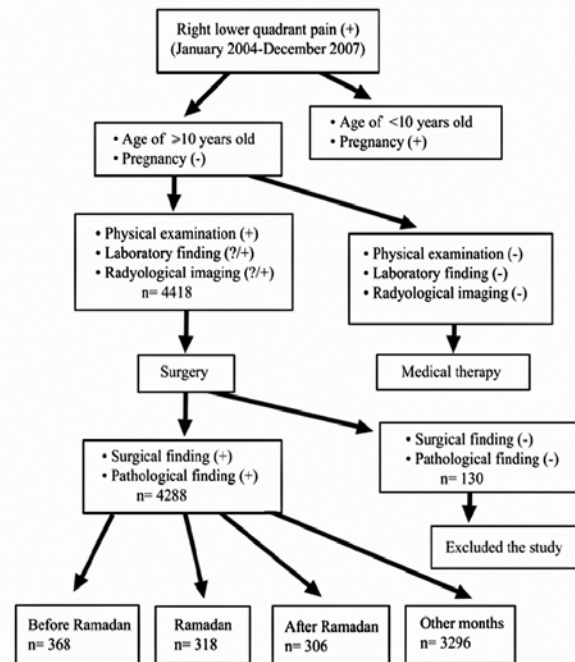


Figure 1 - Summary of patient disposition.

detected between the gender regarding the number of patients with perforation ($p>0.05$). No significant difference was detected between these periods based on different age groups ($p>0.05$) (Table 1). Distribution of the cases by year is presented in Figure 2.

Discussion. Muslim adults fast by staying hungry for 11-18 hours everyday for approximately a month during the Ramadan. The reduction in the number of meals and the limitations in fluid and food intake cause certain changes in the metabolism during this period.⁴ The effects of these changes on the human metabolism were evaluated in many studies. Benaji et al¹⁴ reported that increases and decreases may occur in some biochemical values during this period. Some other studies reported that hunger has minimal effect on stable heart diseases⁸ and significant changes are not observed in the frequency of acute cholecystitis.⁷ Donderici et al, on the other hand, reported that the frequency of peptic ulcer complications during the month of Ramadan in Turkey was higher than the periods before and after the Ramadan.⁹ However, the relationship between acute appendicitis, which is a frequently encountered disease in the surgery clinics and long-term hunger was not evaluated. Although acute appendicitis is one of the most frequently operated diseases of the abdomen, its cause has not yet been figured out precisely.¹¹ The difference that we observed between different regions of the same country having different socio-cultural characteristics in terms of the frequency of appendicitis has made the risk factors for appendicitis a subject of

dispute.¹¹ The most important factor that is still in dispute today is the diet hypothesis. According to this hypothesis, certain factors such as daily nutritional routines and the type of the consumed food play a role in the etiology of the appendicitis by affecting the amount, form, and rate of the feces passing through the intestines.¹⁵ Another study has reported that the reduction in the intestinal contractility is effective in the formation of acute appendicitis.¹⁶ Brumer¹⁷ reported that dehydration of the body increases the risk of blockage in the appendix lumen and subsequent inflammation by causing fecal dehydration and fecal stasis. Azizi¹ reported that a decrease in the intestinal contractility occurs once every 2 hours during hunger. We investigated whether the changes that can occur in the nutritional routines

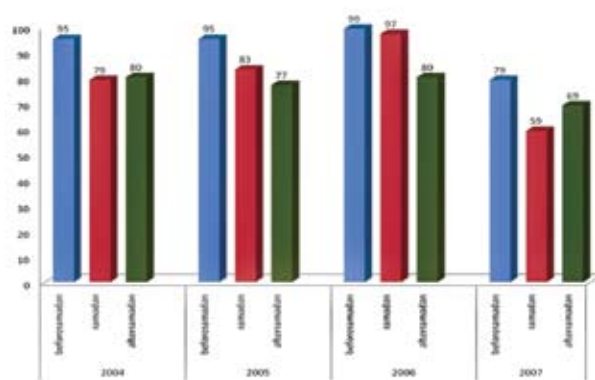


Figure 2 - The distribution of patients with acute appendicitis according to the years and before Ramadan, during Ramadan and after Ramadan

Table 1 - Distribution of the patients operated with a diagnosis of acute appendicitis before, during, and after the Ramadan between the years 2004 - 2007.

Variables	Total	Before Ramadan		During Ramadan		After Ramadan		Total	P value (95% Confidence Interval)
		n	%	n	%	n	%		
Gender									
Female	390	142	(38.6)	135	(42.5)	113	(36.9)	390	$p>0.05$
Male	602	226	(61.4)	183	(57.5)	193	(63.1)	602	
Pathologic									
<i>Non-perforated</i>									
Female	352	131	(38.3)	121	(41.4)	100	(35.4)	352	$p>0.05$
Male	564	211	(61.7)	171	(58.6)	182	(64.6)	564	
Total	916	342	(92.9)	292	(91.8)	282	(92.2)	916	
Features									
<i>Perforated</i>									
Female	38	11	(42.3)	14	(53.8)	13	(54.1)	38	$p>0.05$
Male	38	15	(57.7)	12	(46.2)	11	(45.9)	38	
Total	76	26	(7.1)	26	(8.2)	24	(7.8)	76	
Age groups									
<20	302	111	(30.2)	93	(29.3)	98	(32)	302	$p>0.05$
20-40	510	193	(52.4)	159	(50)	158	(51.6)	510	
41-60	140	52	(14.1)	51	(16)	37	(12.1)	140	
>61	40	12	(3.3)	15	(4.7)	13	(4.3)	40	
Total	992	368	(37.1)	318	(32.1)	306	(30.8)	992	

and intestinal mechanisms resulting from the lack of fluid and food intake throughout the day affect the appendicitis incidence based on gender and age. As a result of our study, we found that long-term hunger, the fluid and food limitations, and the changes in the nutritional routines do not cause any increase in the acute appendicitis frequency. The most important reason for this finding is possibly physiological alterations in the intestine and stomach due to hunger. Suzuki et al¹⁸ reported that an increase occurs in the level of motilin, a gastrointestinal system hormone, during the hunger period. The increased motilin level stimulates the proximal and distal stomach and intestinal contractions and increases the evacuation rate of the stomach and the speed of small bowel passage. Poitras and Peeters reported that the endocrine regulation of the Migrating Motor Complex (MMC) that regulates the intestinal motility is performed by motilin.¹⁹ In the same article, it was reported that the motilin level that increases during the hunger period causes powerful peristaltic contractions once every 90-120 minutes with the migration waves it creates.¹⁹ Another reason is the positive effect of hunger on the immune system and acute inflammation. Latifynia et al²⁰ indicated that hunger does not negatively effect on the immune system. Aksungur et al²¹ reported that prolonged fasting caused a significant decrease on homocysteine, which is a immun sytem regulator, C-reactive protein (CRP) which is acute inflammation marker and Interlukin-6 (IL-6) which is a proinflammatory cytokine induce CRP production, levels. In the present study, a negative correlation was found between increased vitamine B12, folate and decreased homocystein levels in the body during prolonged hunger. Decreased homocystein level leads depletion of inflammation, IL-6 and CRP levels. Furthermore, it should be expected a decrease on the IL-6 and CRP levels during the prolonged fasting period of which levels are expected to increase following meals and consumption of fatty foods. Acute appendicitis incidence is possibly affected positively by prolonged hunger. Studies revealing that prolonged hunger does not exacerbate acute inflammation supports present findings and our results.^{7,21,22} Therefore, a reduction in the acute appendicitis incidence should be expected during the hunger period because of the increase in the intestinal contractility, contrary to the explanations of Azizi. Our results were in accordance with the articles of Suzuki et al¹⁸ and there was a reduction in the number of patients with a reduction in the acute appendicitis during Ramadan. Although insignificant, we think that continuation of the decrease observed in this period after the end of the fasting period is associated with the positive effects of the long-term controlled hunger.

This study has some limitations: the nutritional styles of the patients with were not investigated.

The nutritional routine of these patients and healthy subjects can be compared. The effects of changes in the environmental factors (climate changes, existence of infection agents, hygiene, and so forth) during long hunger terms at the 2 hospital areas were not investigated, though the importance of these factors were reported in the literature.²³ Since this is a retrospective study, such factors were not investigated sufficiently.

In conclusion, certain factors such as the contents and amount of consumed foods and intestinal contractility have been reported to be effective in the development of appendicitis. Ramadan fasting is a kind of religious exercise in which certain changes are observed in these factors. As a result of our study, we found that the changes observed in this period and long-term controlled hunger did not have any negative effect on the frequency of appendicitis and did not constitute a risk factor for acute appendicitis. However, prospective studies consisting of longer periods and more patients are needed.

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Related topics

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