

The Relationship Between Ambient Temperature And Acute Cholecystitis

Ortam Sıcaklığı Ve Akut Kolesistit Arasındaki İlişki

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ABSTRACT

AIM: Acute cholecystitis is one of the most common emergencies of general surgery. Although there is an increase in the incidence of acute cholecystitis in the summer season when the temperature increases, its cause is not fully understood. The aim of this study is to determine the relationship between acute cholecystitis and temperature.

MATERIAL AND METHOD: 271 patients admitted to the general surgery service in 2021 were included in this study. Patient data were obtained retrospectively from patient files and data from national centers were used for meteorological data. Conformity of continuous variables to normal distribution was evaluated using visual and analytical methods.

RESULTS: According to the percentage distribution of cases, acute cholecystitis was most common in summer and least in winter. A very strong positive correlation was found between monthly mean temperature values and monthly incidence of acute cholecystitis (correlation coefficient: $r=0.759$ and $p=0.004$).

CONCLUSION: The incidence of acute cholecystitis also increases with increasing ambient temperature, and this is important in terms of planning health services

ÖZET

AMAÇ: Akut kolesistit, genel cerrahinin en sık görülen acillerinden biridir. Sıcakların arttığı yaz mevsiminde akut kolesistit görülme sıklığında artış olmasına rağmen nedeni tam olarak anlaşılamamıştır. Bu çalışmanın amacı akut kolesistit ile sıcaklık arasındaki ilişkiyi belirlemektir.

GEREÇ VE YÖNTEM: Bu çalışmaya 2021 yılında genel cerrahi servisine başvuran 271 hasta dahil edildi. Hasta verileri retrospektif olarak hasta dosyalarından elde edildi ve meteorolojik veriler için ulusal merkezlerden alınan veriler kullanıldı. Sürekli değişkenlerin normal dağılıma uygunluğu görsel ve analitik yöntemlerle değerlendirildi.

BULGULAR: Olguların yüzde dağılımına göre akut kolesistit en sık yaz aylarında, en az ise kış aylarında görüldü. Aylık ortalama sıcaklık değerleri ile aylık akut kolesistit insidansı arasında çok güçlü bir pozitif korelasyon bulundu (korelasyon katsayısı: $r=0.759$ ve $p=0.004$).

SONUÇ: Ortam sıcaklığı arttıkça akut kolesistit insidansı da artmaktadır ve bu durum sağlık hizmetlerinin planlanması açısından önemlidir.

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INTRODUCTION

Acute cholecystitis is one of the most common causes of general surgery emergencies. It develops as a result of the activation of inflammatory pathways due to stasis in the gallbladder, mostly due to obstruction of the cystic duct by a gallstone.¹ In addition, dehydration caused by high temperature can also cause acute cholecystitis. Dehydration increases bile stasis. Stasis can lead to increased bile concentration and viscosity. Bile stasis also causes an increase in intraluminal pressure within the gallbladder, which triggers the acute inflammatory process.² Another factor that may increase its incidence is the increased incidence of bacterial infection with high temperature.^{3,4}

In the literature, there are studies showing that high temperature is associated with myocardial infarction, acute kidney injury, sepsis and inflammatory diseases.⁵⁻⁷ However, there is not enough study in the literature about the relationship of acute cholecystitis with temperature. Determining the needs of the health system according to the seasons and months will reduce the burden on the health system and help executives to balance health expenses. The aim of this study is to evaluate the relationship of acute cholecystitis, which has an important share in emergency department admissions, with seasons, months and average temperatures, as well as to obtain information about its etiopathology and to reveal data to be used in the health system.

MATERIAL AND METHOD

This is a single-center, cross-sectional, retrospective study conducted on 271 acute cholecystitis cases admitted to the general surgery service in our hospital in 2021. This study was approved by Clinical Research Ethics Committee of Ankara Training and Research Hospital with the decision dated 8.6.2022 and numbered 994/2022. The diagnosis of acute cholecystitis was made based on the patient's history and physical examination, and then confirmed by laboratory tests and radiological imaging methods. The demographic data of the patients and the follow-up periods in the service were recorded retrospectively from the patient files. The average temperature values of the month in which the patients were followed were obtained by using national meteorological data. In the study, September-November period is defined as "Autumn season", December-February as "winter season", March-May as "Spring season", and June-August as "Summer season". The data of the study were analyzed with the SPSS 23.0 (Statistical Package for Social Sciences) program. Before data evaluation, descriptive statistics were made. In descriptive statistics, categorical variables are given as numbers and percentages; Continuous variables are presented as mean \pm standard deviation. Conformity of continuous variables to normal distribution was evaluated using visual (histogram and probability graphs) and analytical methods (Kolmogorov Smirnov/Shapiro-Wilk tests). Spearman correlation analysis test was used for correlation analysis. Statistical significance level was accepted as $p < 0.05$.

RESULTS

A total of 271 patients were included in the study. The mean age of the patients was 55.1 ± 17.4 years. It was observed that 104 (38.4%) of the patients included in the study were male and 167 (61.6%) were female

Table 1. Sociodemographic Characteristics of the Patients

	Average	Sd*
Age (n=271)	55,1	17,4
	Number	Percent**
Sex (n=271)		
Male	104	38,4
Female	167	61,6

* Standard deviation, ** Column percentage

During the study period, 36.9% of all patients were diagnosed with cholecystitis in summer, 24.7% in spring, 19.6% in autumn, and 18.8% in winter (Table 1). The highest number of cases (n:100) was seen in the summer season, while the lowest number of cases (n:51) was observed in the winter season. When the frequency of acute cholecystitis cases were analyzed by months, it was found that the highest number of cases were in July (n:37), June (n:34) and August (n:29)

Table 2. Acute cholecystitis incidence rates according to seasons and months

	Number	Percent*
Season of diagnosis of acute cholecystitis (n=271)		
Spring	67	24,7
Summer	100	36,9
Autumn	53	19,6
Winter	51	18,8
Month of diagnosis of acute cholecystitis (n=271)		
January	18	6,6
February	16	5,9
March	19	7,0
April	20	7,4
May	28	10,3
June	34	12,5
July	37	13,7
August	29	10,7
September	19	7,0
October	16	5,9
November	18	6,6
December	17	6,3

* Column percentage

Table 3. The relationship between monthly acute cholecystitis incidence rates and monthly average temperatures

	Ort.	Ss.	1	2
1 Monthly Average Temperature	13,350	8,1623	1	
2 Number of Cases per Month	22,58	7,3910	0,759**	1

** $p < 0,01$

shows the correlation analysis between the variables. A very strong positive correlation was found between monthly mean temperature values and monthly incidence of acute cholecystitis (correlation coefficient: $r = 0.759$ and $p = 0.004$).

DISCUSSION

The Covid 19 pandemic has shown that healthcare systems must always be ready for any challenge. The efficient use of health resources and the functioning of the system at all times are possible with effective planning. For this reason, it is necessary to define the seasonal variations of the diseases and plan accordingly. Seasonal variations related to some infectious, non-infectious and surgical diseases have been described.⁸ These studies are helpful in revealing the interactions of seasonal behavioral and physiological changes of people with the environment.⁹

In addition, it contributes to the understanding of the impact of seasons on health economics and expenditures, enabling us to obtain important data for health service predictions.^{10,11} Climate change and global warming are not only a major problem affecting humanity but also a factor that increases the mortality and morbidity of some diseases.¹² The effect of air temperature on morbidity is an important public health problem. A large number of hospitalizations each year are associated with seasonal changes.¹³ Diseases that may require emergency surgical intervention are generally costly due to the use of expensive diagnostic methods, operations and intensive care services. The estimated annual costs of diseases such as acute appendicitis, cholecystitis and diverticulitis, which constitute the urgent burden of general surgery, to the health system were calculated as 3 billion dollars, 6 billion

dollars and 2.5 billion dollars, respectively.^{14, 15} These diseases, whose incidence increases with the increase in temperature, cause more use of increasing hospital resources.¹⁶

In our study, the effect of air temperature, one of the environmental factors that can affect the etiopathology of acute cholecystitis, was investigated. It has been found that increasing air temperature and therefore summer season is associated with an increased incidence of acute cholecystitis. Similarly, Hosseini et al. found that increased temperature is a factor that increases the incidence of cholelithiasis and consequently cholecystitis.¹⁷ In another study, which examined the data of more than six hundred thousand patients in Tokyo, it was shown that temperatures above 10 degrees and below minus 5 degrees increased the incidence of acute cholecystitis.¹² In our study, the number of cases was the lowest during the winter months and no relationship was found between low temperature and acute cholecystitis. The results of another retrospective study covering 30 years showed that the incidence was higher in summer months, as in our study.⁸ In another multicenter retrospective study conducted in Japan, a significant correlation was found between acute cholecystitis and temperature.¹⁸ The biggest limitation of our study is that it examines the one-year time frame.

Accordingly, anticipating the need for health resources during periods of increased patient density is an important component of the proper use of health care facilities and optimizing patient care.

CONCLUSION

Increasing air temperature is one of the etiological factors that increase the incidence of acute cholecystitis. Such studies are needed in the planning of health services.

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