

# The Effect of Seasonal Variation on Developing Acute Cholecystitis among Adult Patients in Jeddah, Saudi Arabia

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**Abstract:** Background: Summer is known to be a predisposing factor in the occurrence of some diseases. This particularly holds true in the case of increasing number of acute cholecystitis cases in a country like Saudi Arabia, which has a desert climate. Aims: To find the association between seasonal variation and the onset of acute cholecystitis and to compare the severity and frequency of acute cholecystitis during different seasons. Methodology: a cross sectional study which included all emergent patients with gallstone induced cholecystitis admitted at king Abdulaziz university hospital during the period between 2005-2014; excluding those below 20 years of age and/or pregnant and elective admissions. The diagnosis of acute cholecystitis was based on clinical examination and history and subsequently confirmed by ultrasound, CT, ERCP and lab results. The severity of acute cholecystitis was measured by using the TG13 diagnostic criteria and severity grading of acute cholecystitis. Results: The study included 161 cases with a definite diagnosis of acute cholecystitis. Summer season showed the highest percentage of occurrence of emergent acute cholecystitis (38.13%); followed by winter (22.50%), spring (21.88%), and fall (17.5%). Spearman test showed statistically significantly negative correlation between the season when the surgery was done and the severity of the acute cholecystitis. The disease was most severe in summer season; ( $r=-0.169$ ) correlation coefficient and p-value ( $P= 0.046$ ). Conclusion: Summer season is a major aggravating factor for acute cholecystitis. The frequency and severity is significantly higher during summer as compared to other seasons of the year.

**Keywords:** Acute cholecystitis, summer, severity.

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## 1. INTRODUCTION

Acute Cholecystitis mostly is a complication of gallstones. Seasonal changes affect health. [1] During summer dehydration occurs due to perspiration and insufficient water intake. Hence increase vulnerability to gallstones and adversely affects gallbladder emptying. [2]

Previous studies correlates between summer and cholecystitis. [1] [3] We believed it would be clinically valuable to further probe into the impact of summer on developing cholecystitis; this could help in understanding the etiology and taking appropriate remedial measures. Therefore, this study designed to find out the association between seasonal variation and the onset of acute cholecystitis also to compare the severity during different seasons

## 2. SUBJECTS AND METHODS

This was a cross sectional study, which included all patients, diagnosed with gallstone-induced acute cholecystitis with emergent admissions during the period between 2005-2014.

Patients less than 20 years of age and or pregnant females were excluded from study participation and the elective admissions.

A data collection sheet was used for systematic documentation of patients' data. The data collection sheet included information regarding the patients' demographics, past medical history, chief complain (duration and site of tenderness and number of emergency hospitalizations associated with the tenderness), surgery (date of surgery, time and the season during surgery), details of laboratory evaluations, (CBC,LFT, U&E, US,ERCP,CT) associated complications and disease severity .The data collection process was planned and executed by medical students using the medical registration numbers of the patients from the medical records and data collection sheets were completed for all subjects.

In the context of this study, it was essential to succinctly and precisely define the different seasons as they occur in the calendar year, with respect to Saudi Arabia. For this purpose, we obtained climatological data put forth by previous research (4) (5). As per this information, the months of summer are May, June, July, August, September; winter spans over December, January, February; and spring occurs during March and April while fall takes place during October and November.

The diagnosis of acute cholecystitis was done based on clinical examination and history and subsequently confirmed by ultrasound, CT, ERCP and lab results The severity of Acute cholecystitis was measured by using the TG13 diagnostic criteria and severity grading of acute cholecystitis (6)

Data was analyzed using the SPSS version 22. The Spearman test was used to study the association between the severity of acute cholecystitis and season of the year.

### 3. RESULTS

A total of 176 patients were diagnosed with gallstones induced emergent cholecystitis at KAUH during 2005-2014 . Of these 15 could not participate in the study as they met the inclusion criteria (8 patients were below 20 years of age whereas 7 were pregnant).

The study included 161 cases with a definite diagnosis of acute cholecystitis. Of these, 26.1% were males and 73.9% were females. The patient age group of 40-49 years was most affected by acute cholecystitis wherein the highest occurrence of 28.6% was recorded.

Of the 161 cases with Acute cholecystitis 143 had went under surgical cholecystectomy at the same admission.

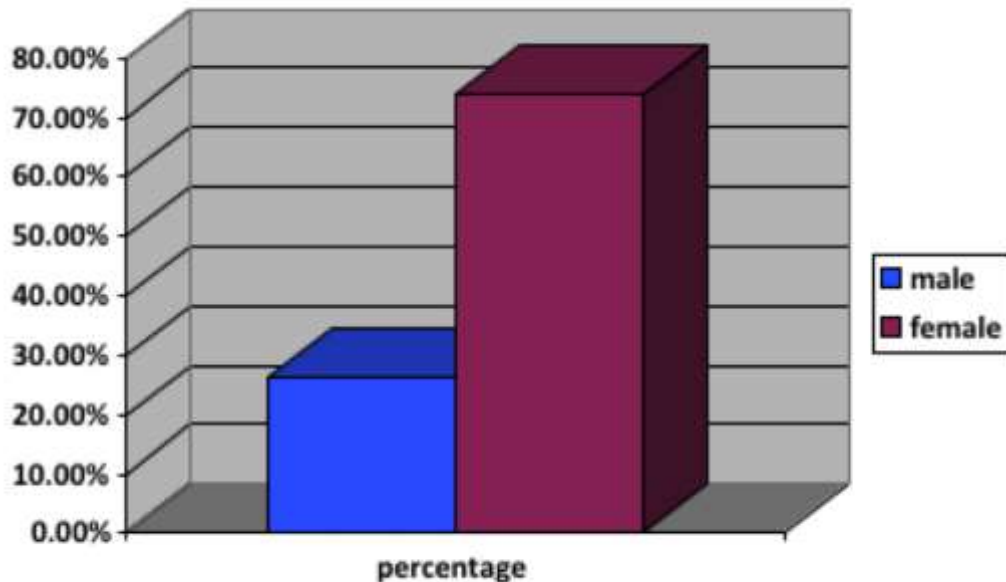


Figure 1: percentage of Male and Female diagnosed with acute cholecystitis

A positive correlation was noted between the frequency of acute cholecystitis and different seasons. The summer season showed the highest percentage of occurrence of emergent acute cholecystitis (38.13%); followed by winter (22.50%), spring (21.88%), and fall (17.5%) This result has been diagrammatically represented in the Bar chart below.

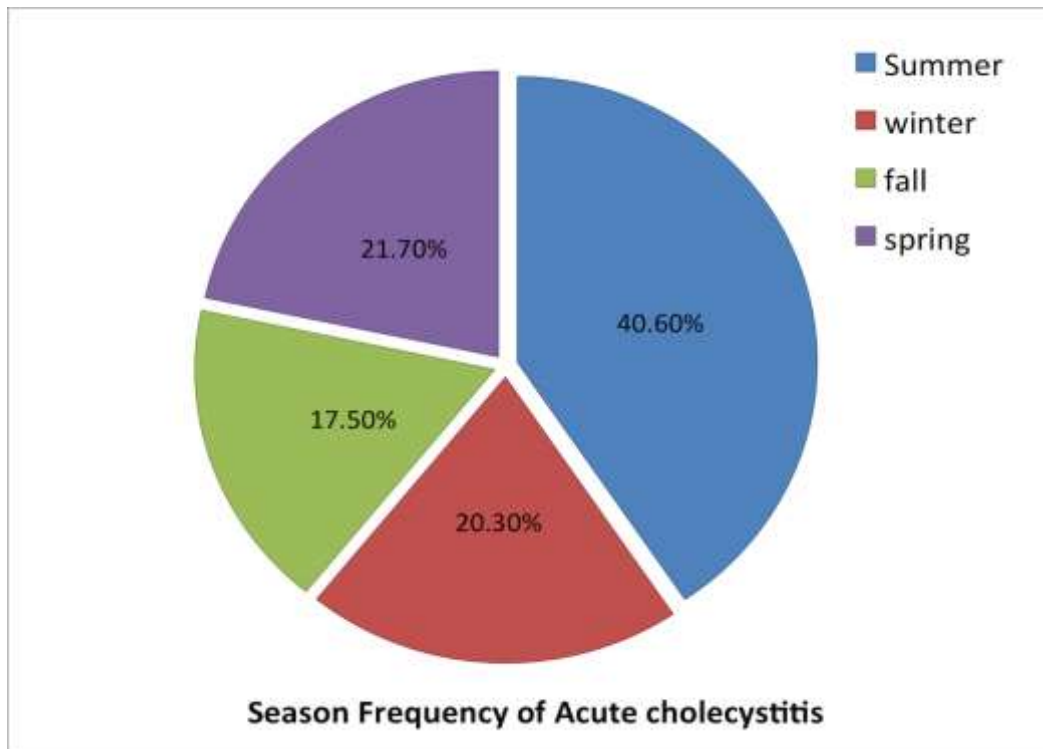


Figure 2: percentage of Seasonal frequency of acute cholecystitis

Spearman test showed statistically significantly negative correlation between the season of acute cholecystitis when the surgery was done and the severity of the acute cholecystitis .the disease was most severe in the summer season; ( $r = -0.169$ ) correlation coefficient and p-value ( $p=0.046$ ). This result has been represented in the [Table 1].

Table 1: Correlation between the season of acute cholecystitis when the surgery was done and the severity of the acute cholecystitis

	Season of surgery				Total
	Summer	Winter	Fall	Spring	
<b>Grade1 Mild</b>	28.4%	17.0%	14.9%	18.4%	78.7%
<b>Grade2 moderate</b>	11.3%	2.1%	2.1%	2.8%	18.4%
<b>Grade3 severe</b>	1.4%	.7%	0.0%	.7%	2.8%
<b>Total</b>	41.1%	19.9%	17.0%	22.0%	100.0%

#### 4. DISCUSSION

Acute cholecystitis is inflammation of the gallbladder, which can most often be attributed to a gallstone obstructing the cystic duct. Right upper quadrant pain and tenderness, accompanied by fever, chills, nausea, and vomiting are common clinical features of this condition. Abdominal ultrasonography is a useful radiographic method of diagnosis and its treatment usually involves antibiotics and cholecystectomy. Acute cholecystitis is the most common complication of cholelithiasis and 95% of patients with acute cholecystitis have cholelithiasis. Inflammation occurs because of the persistent presence and obstruction caused by a gallstone impacted in the cystic duct. The damaged mucosa secretes more fluid into the gallbladder lumen than it absorbs. This distends the lumen causing further damage and release of inflammatory mediators like prostaglandins, which further perpetuate inflammation. The condition gets further complicated when super imposed with bacterial infection. The vicious circle of fluid secretion and inflammation, when unchecked, leads to necrosis and perforation. If acute inflammation resolves then continues to recur, the gallbladder becomes fibrotic and contracted and does not concentrate bile or empty normally—features of chronic cholecystitis.

Gallstone formation may occur due to varied reason with interaction of genetic and environmental factors. Obesity, aging, estrogen treatment, pregnancy and diabetes are known risk factors that escalate the risk of gallstones and indirectly increase one’s vulnerability to acute cholecystitis. A number of dietary factors have been involved in the pathogenesis of

cholelithiasis. Consumption of saturated fat has been mostly associated to a higher risk. On the other hand, intake of fibrous food and moderate consumption of alcohol have been shown to reduce the risk. The association between cholesterol intake and gallstone disease has been variable in different studies (8). Likewise, in Saudi too, incorrect and unhealthy food habits, particularly in the summer season, which is often the period of celebrations; can act as a trigger for gallstone formation and subsequent acute cholecystitis.

While comparing our studies with past evidence, we find it note worthy to highlight the fact that the results of our study are in sync with a similar study in Taiwan. The study conducted in Taiwan was a 13-year long study involving 1,92,833 patients who underwent cholecystectomy. The study elucidated a notable increase in cholecystectomies during summers. (1) In the same vein, the findings of Hosseini et al also concur with the results of our study. Hosseini et al too concluded through their study that the summer season is a definite aggravating factor for gallstones and subsequent cholecystitis. (3) To further extrapolate this understanding to the context of Saudi Arabia as a country, we would like to reiterate that the intensely hot summers of the country could cause rapid dehydration, particularly among those who do not drink adequate quantities of water or other hydrating fluids. Hence, in a country like Saudi Arabia, which has a desert climate, excessive dehydration during summers can further augment the risk of gallstones.

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