

Seasonality in Presentation of Acute Appendicitis

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Abstract

Background: To assess the trends in incidence of appendicitis and pattern of variation with age, sex, and seasons of the year.

Methods: In this cross-sectional prospective study patients who underwent appendectomy for acute appendicitis were included. The demographic features, length of hospital stay, seasonal variation and post-operative outcome were assessed. The diagnosis of acute appendicitis was established by history, examination and investigations in term of leukocyte count, urinalysis and ultrasound exam in many of these cases. In North Punjab region, the year is divided into two well-marked seasons with short transitional periods between the long hot rainless summer (May to October) and comparatively short cool winter (December to February). SPSS version 16 was used for all the statistical assessments and analysis

Results: Out of 972 patients, 53% patients were males. Age range was from 5-70 years. All the patients treated surgically by open and laparoscopic means. Forty patients were found to have perforated appendix, 12 patients presented with abdominal mass and 3 patients presented with appendicular abscess. A significant seasonal effect was observed, with the rate of acute appendicitis being higher in the summer months.

Conclusion: A seasonal pattern of appendicitis with a mostly predominant peak is seen during the summer months could be due to increased gastrointestinal infections in summer. The males have higher incidence of acute appendicitis with 11-20 years of age being most common age group.

Key Words: Acute Appendicitis, Seasonal Pattern, Complicated Appendicitis

Introduction

Acute appendicitis presents to surgical emergency throughout the year making it the most commonly operated surgical condition of the abdomen. Recently many researches have reported that several acute

medical illnesses do not happen to take place randomly rather exhibit a higher frequency in particular months of the year. Appendicitis is the most common acute surgical condition of the abdomen and it has been reported to be present throughout the year, but some particular months are associated with higher incidences.^{1,2,3,4} Higher incidence is described by many authors during months of summer.⁴ The grounds behind raised number of acute appendicitis cases in summer not clearly known, though some researchers have indicated that the heterogeneous factors such as gastrointestinal infection, air pollution and low fiber diet, during summer months could be chipping in to the higher incidence of appendicitis.⁶⁻¹¹

Consistently, other reports have found that in infant, acute appendicitis is relatively rare, and becomes increasingly common in childhood and early adult life, reaching a peak incidence in the adolescents and early 20s.¹¹⁻¹⁵ After middle age, the risk of developing acute appendicitis is quite small.^{16,17} It has been demonstrated that the male gender is affected slightly more than female counterparts.¹⁷⁻²⁰

Patients and Methods

This is a cross-sectional prospective study of patients who underwent appendectomy for acute appendicitis admitted to Holy Family Hospital Rawalpindi, department of surgery from November 2014 to October 2016. The demographic features, length of hospital stay, seasonal variation and post-operative outcome were assessed in this study. Population in current study were divided by sex and age into 7 groups (less than 10, 11-20, 21-30, 31-40, 41-50, 51-60 and 61-70 years). In current study the diagnosis of acute appendicitis were established by history, examination and investigations in term of leukocyte count, urinalysis and ultrasound exam in many of these cases. All the normal appendices were excluded from the study. In North Punjab region, the year is divided into two well-marked seasons with short transitional periods between the long hot rainless summer (May to October) and comparatively short cool winter (December to February). SPSS version 16

was used for all the statistical assessments and analysis.

Results

In 972 patients , mean age was 21 years(range:5-70 years). Males constituted 52.7%(Table 1). Increased incidence of acute appendicitis was observed from May to October (summer) in comparison to December to February (winter) (Table 2). This study shows that 399 patients (41%) were presented in summer in comparison to 226 (23.2%) and 194 (20%) in the winter and autumn respectively. whereas in short spring season only 153 patients (15.8%) were presented with acute appendicitis. this shows that there was statistically significant seasonal pattern variation in the incidence of acute appendicitis, which was evident and peaked in summer and dipped in spring (p value 0.01). Fifty five patients were presented with complicated appendicitis (Table 3). Forty Patients (4.1%) presented with perforated appendix, 12 (1.23%) patients presented with abdominal mass and 3 (0.3%) patients presented with appendicular abscess. Complicated appendicitis in male (3.5%) more than the female (1.66%) (Table 3). This might be explained by more overall number of male 513(52.7%) with acute appendicitis in comparison to female patients 459 (47.3%) and male to female ratio is 1.12:1. The complications of acute appendicitis were observed mainly in patients in age group 40 and over (Table 4). Complicated appendicitis in current study was significantly correlated to age variation (p- value 0.01). Complicated appendicitis in this study was significantly distributed over the different seasons of year and showed more complicated appendicitis in summer probably due to more overall cases of acute appendicitis (p- value 0.02) (Table 5).

Table 1.Population distribution according to different age groups

Age groups	Females No(%)	Males no. (%)	Total no. (%)
Less than 10	37(3.83)	50(5.13)	87(8.96)
11-20	187(19.23)	198(20.4)	385(39.63)
21-30	128(13.18)	136(14)	264(27.18)
31-40	76(7.79)	86(8.8)	161(16.59)
41-50	19(2.0)	29(3.0)	48(5)
51-60	8(0.8)	13(1.3)	21(2.1)
61-70	4(0.5)	1(0.1)	6(0.6)
Total	459(47.3)	513(52.7)	972(100)

It was found that the mean length of hospital stay for patients with acute appendicitis was 2 days and the mean length of hospital stay for patients with complicated appendicitis was 4 days. There was no difference in the length of hospital stay between males and females and between patients presented in summer and winter. But this parameter linked to whether the case associated with complications or not.

Table 2.Monthly distribution of incidence of appendicitis

Month	No of Patients	Percentage
January	67	6.9%
February	65	6.7%
March	66	6.8%
April	89	9.1%
May	98	10.1%
June	96	9.9%
July	92	9.5%
August	91	9.4%
September	85	8.7%
October	83	8.5%
November	77	7.9%
December	63	6.5%

Table 3.Cases of acute appendicitis according to sex and complications.

Gender	Overall	Non Complicated Acute Appendicitis	Complicated Acute Appendicitis
Female	459 (47.3%)	435 (44.85%)	24 (2.45%)
Male	513 (52.7%)	482 (49.5%)	31 (3.2%)
Total	972 (100%)	917 (94.35%)	55 (5.65%)

Table 4.Distribution of the complicated appendicitis according to the age groups.

Age group No	Females No	Males No	Total No(%)
Less than 10 (87)	1	2	3 (3.44%)
11-20 (385)	7	10	17 (4.41%)
21-30 (264)	4	9	13 (4.92%)
31-40 (161)	4	7	11 (6.83%)
41-50 (48)	2	4	6 (12.5%)
51-60 (21)	1	2	3 (14.28%)
61-70(6)	2	0	2(100%)

Total (972)	24	31	55 (5.65%)
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Table 5. Distribution of complicated appendicitis over different seasons.

Seasons	Non-Complicated Acute Appendicitis	Complicated Acute Appendicitis	Total
Summer	366	33 (8.27%)	399
Winter	217	9 (3.98%)	226
Autumn	187	7 (3.6%)	194
Spring	147	6 (4.1%)	153
Total	917	55 (5.65%)	972

Discussion

In present study the incidence of acute appendicitis was more prominent in the summer months and the lowest incidence was observed in the spring months showing seasonal variation. This corresponds the results of other reports.¹⁷In other report, a higher incidence of acute appendicitis has been observed in the summer months and a low incidence in the winter months.^{18, 25} One of the most striking epidemiologic features of appendicitis is the marked variation in incidence by age and sex. In this study, the highest incidence of appendicitis was observed in people aged 10-19 years, both males and females. This observation is consistent with the findings in other studies.^{11,12,18} Males had a higher incidence of appendicitis than females in all age groups. This finding also has been reported previously.^{12,15}

Acute Appendicitis cases occur uniformly throughout the year with some month having association of higher incidences varying from region to region. Summer months are described to be associated with by higher incidences in many studies by different authors.²⁰In this study the months of May to October present a high incidence (with peaks in June to August), this coincide with the findings from California and Italy.^{14, 17}The evidence of seasonal variation depicts the possibility of heterogeneous extrinsic factors such as, humidity, allergens, sun radiation, and viral and bacterial infections in the etiology of appendicitis. The gradual increase in the number of cases from the month of April, match with the onset of the rainy season, the intensity of which increases toward the months of July, August, and September. Higher humidity, which occurs during this period, has been implicated by some authors.^{13,}

²¹Khaevelet al, also postulated the importance of the actual reduction of sun radiation and vast fluctuations in air temperature, in the incidence of appendicitis.²¹The high prevalence of intestinal parasites infestations and bacterial infections have been account for some cases of appendicitis as it has been noticed to be initiated by or associated with them. Infection causes lymphoid hyperplasia leading to appendix lumen obstruction. Seasonal peak of infection by campylobacteriosis, salmonellosis, Escherichiacoli, cryptosporidiosis, Entamoeba histolytica, and Ascaris lumbricoides, Trichuris trichiura, Taenia saginata, Enterobius vermicularis and Strongyloides stercoralis that has been implicated in appendicitis pathogenesis, exhibits a summer peak in some countries of an environment with poor sanitation.^{6-8, 25, 26}

Outdoor air pollution has been suggested as one of several factors that influence the incidence of appendicitis.⁹ In addition, exposure to air pollution has been shown to increase susceptibility to bacterial and viral infections through impairment of microbial defence.^{22- 24}

In this study, the complications of acute appendicitis reported mainly in patients in age group 40 and over. This might be attributed to a delay in the presentation of those patients or the diagnosis was late. This is possibly due to the unnecessary usage of analgesia particularly for patients in such age groups. In other records they observe a high perforation rate in patients in the 0-9 year age group and those older than 50 years.⁴ In addition, in current study, acute appendicitis was obviously correlated to gender variation possibly explained by more overall number of male with acute appendicitis in comparison to female patients but there was not correlated to seasonal variation. In addition, more complicated acute appendicitis in summer observed in this study could be attributed to more over all patients with acute appendicitis in this season. The mean length of stay for patients underwent appendectomy comes in accord with results of other workers.²⁵It was observed that the difference in length of hospital stay strongly related to whether the case complicated or not complicated appendicitis and it is not linked to the seasonal, gender and age variations. This finding is agreed upon it in other reports.

Conclusion

1.Acute appendicitis commonly presenting illness in surgical setups and tends to occur more usually in males and has higher incidence in teenage people.

2. It has seasonal pattern of presentation occurring commonly in the summer months particularly in May.
3. The probability of complicated acute appendicitis increases with advancing age and seen in older age groups mainly.
4. Mean length of hospital stay is more among patients with complicated appendicitis in comparison to the non-complicated appendicitis.

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