

## Original Article

### Summer Surge of Acute Appendicitis in Adults

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**Background :** The most common acute surgical condition of the abdomen is Appendicitis. There is growing evidence base to suggest the seasonal variation in causation of acute Appendicitis. Some studies have concluded that acute Appendicitis is a more common summer with reason still not clear. The rationale for our study is to determine whether there is seasonal association with the incidence of acute Appendicitis. The strong association if found will help in preplanning the management and preventing the incidence of severe complication of the disease.

**Materials and Methods :** This retrospective model was conducted from 01/05/2016 to 30/04/2021 in a patient who was diagnosed with acute Appendicitis. The total admission for acute Appendicitis were collated with calendar month to compare with seasonal variation. Then the number of cases of acute Appendicitis were segregated with respect to age and gender. Results were analysed in terms of number of cases and complications of acute Appendicitis in adults with respect to corresponding months in a year.

**Results :** During the observation period, 620 cases had been admitted with the diagnosis of acute appendicitis. The highest incidence of acute Appendicitis was seen in the 18-29 years age group (54%). In all age groups the incidence declined with age increment. A significant seasonal effect was also observed, the rate of acute Appendicitis was high in summer and was highest in the month of May (11.8%) and the lowest number of cases were in January (6%). The complication of acute Appendicitis was highest in the month of May (4.9%).

**Conclusion :** Acute Appendicitis and its complications is more common in the summer month and is maximum in the month of May. The clear association will help in preplanning the management and preventing the incidence of severe complication of the disease.

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**Key words :** Acute Appendicitis, Seasonal variation.

The most common acute surgical condition of the abdomen is appendicitis<sup>1</sup>. The most common operation worldwide is Appendectomy<sup>2</sup>. The clinical syndrome which results in inflammation of vermiform appendix is called Appendicitis<sup>3</sup>. Among males and females there is equal distribution<sup>4</sup>.

The causes of appendicitis are unclear and multifactorial. There are a variety of attributable causes like mechanical obstruction<sup>5</sup>, inadequate dietary fibre, smoking<sup>6</sup>, air pollution and familial susceptibility<sup>7</sup>. There is growing evidence base to suggest the seasonal variation in causation of acute Appendicitis<sup>8</sup>.

Acute Appendicitis begins with the classical features of poorly localized colicky abdominal pain. The pain is first noticed in the periumbilical region with anorexia and nausea. Later due to involvement of somatic nerves because of irritation of parietal peritoneum pain gets shifted to the right iliac fossa. The cardinal features of acute Appendicitis is low grade pyrexia, localized abdominal tenderness, muscle guarding and rebound tenderness<sup>3</sup>.

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#### Editor's Comment :

- In summer months, younger patients coming with pain abdomen and tenderness in right iliac fossa is more likely to be acute Appendicitis.
- Early preparedness and early intervention is necessary to avoid complications.

Variable results are obtained from various studies done to determine the seasonal variation of acute Appendicitis<sup>9</sup>. Some studies have concluded that acute Appendicitis is more common summer with reason still not clear. Most epidemiological studies of acute Appendicitis have been conducted and focused on western population<sup>10</sup>. The rationale for our study is to determine whether there is seasonal association with the incidence of acute Appendicitis. The strong association if found will help in preplanning the management and preventing the incidence of severe complication of the disease (Tables 1&2, Figs 1&2).

#### MATERIALS AND METHODS

This retrospective observational study was conducted at the Department of General Surgery, (Victoria Hospital and Bowring and Lady Curzon Hospital), Bangalore Medical College and Research Institute, Bengaluru, from 01/05/2016 to 30/04/2021. Ethical Committee and Medical records department permission was taken. Data was collected from the registers in the medical records department of both

Age (Years)	Frequency	Percentage
18-29	335	54
30-39	166	26.8
40-49	64	10.3
50 And Above	55	8.9
Total	620	100

Month	Abscess	Mass	Perforation	Total (Percentage)
January	0.3	0.2	0.3	0.8
February	0.2	0.3	0.5	1.0
March	0.5	0.3	1.0	1.8
April	0.3	0.8	1.1	2.2
May	0.8	1.8	2.3	4.9
June	0.5	1.3	1.5	3.3
July	0.6	0.6	0.6	1.8
August	0.2	0.5	0.8	1.5
September	0.5	0.0	0.5	1.0
October	0.0	0.2	1.0	1.2
November	0.2	0.3	0.0	0.5
December	0.0	0.3	0.6	0.9
Total	4.1	6.6	10.2	20.9

hospitals. Registers include Surgery case completion register updated by General surgery residents, Anaesthesia case register updated by Anaesthesia residents, and Nurses case register updated by Floor nursing staff of the respective operation theatre complex. Inclusion criteria were set to identify the number of patients over the age of 18 years with an associated diagnosis of acute Appendicitis. There were total number of cases were further analysed to create anonymous database having admission number, age, sex, date of admission and final diagnosis. After entries were made of the patient's data, date-resolved analysis was made. The total admission for acute Appendicitis were collated with calendar month to compare with seasonal variation. Then the number of cases of acute Appendicitis were segregated with respect to age and gender.

An expected number of cumulative admissions per month was established on the basis of a null hypothesis. This was taken to be that the incidence of acute Appendicitis is normally distributed across the year; that there is no seasonal variation over the 12 months and an equal number of episodes should be recorded in each month regardless of the analysed independent variables. An expected number of incident cases for each month was therefore one twelfth of the total figure,  $620/12 =$  approximately 52 cases per calendar month.

Based on the data collected from these registers, the total numbers of cases of acute Appendicitis were tabulated. The data collected was analysed. Results were analysed in terms of number of cases and complications of acute Appendicitis in adults with respect to corresponding months in a year. The study also analysed age wise distribution of acute Appendicitis in adults.

### Statistical Analysis :

The summer surge in the incidence of acute Appendicitis in adults is presented as the number and percentage of total acute Appendicitis cases during the study period. Using the SPSS software package (SPSS 27.0 grad pack) the data were analysed. Count and frequency of patients in each gender, age groups and months were analysed. Comparisons between the frequencies were performed using Chi-square test.

### RESULTS

During the observation period, 620 cases had been admitted with the diagnosis of acute Appendicitis. Of these, 77.4% were males and 22.6% were females (Male: Female=3.424). The highest incidence of acute Appendicitis was seen in the 18-29 years age group (54%). The incidence was highest in males aged 18-29 years. In all age groups the incidence declined with age increment. A significant seasonal effect was also observed, the rate of acute Appendicitis was high in summer and was highest in the month of May (11.8%) and the lowest number of cases were in January (6%). Age group of 18-29 years had the highest number of cases in the month of April (6.1%) and May (6.1%). There was significant association between complication of acute Appendicitis and age groups ( $p=0.040$ ). The complication of acute Appendicitis was highest in the month of May (4.9%). The complication was lowest in the month of January (0.8%).

There was no significant association found between the seasonal changes and the sex of the patient of acute Appendicitis ( $p=0.783$ ).

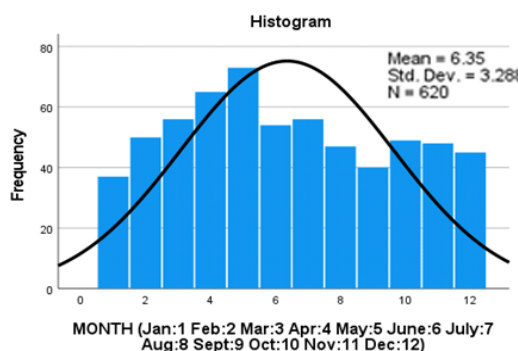


Fig 1 — Seasonal distribution of acute Appendicitis in adults

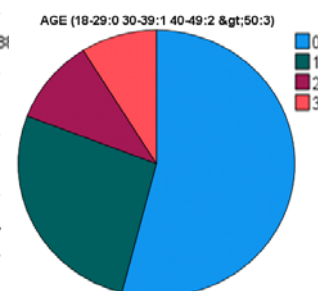


Fig 2 — Age wise distribution of acute Appendicitis in adults

## DISCUSSION

The demographic information from the contributing 620 admission episodes of acute Appendicitis appears consistent with that observed in prior work. In our study a significant seasonal effect was also observed, the rate of acute Appendicitis was high in summer and was highest in the month of May (11.8%) and the lowest number of cases were in January (6%). Age group of 18-29 years had the highest number of cases in the month of April (6.1%) and May (6.1%). The complication of acute Appendicitis was highest in the month of May (4.9%). The complication was lowest in the month of January (0.8%).

Many studies have shown seasonal variation in acute Appendicitis<sup>11-15</sup> and a recent metanalysis, representing some of the strongest evidence for this, showed a peak incidence in the summer months for 9 of the 11 included studies<sup>16</sup>.

A study was conducted by Babita, *et al*<sup>17</sup> in India over from January 2003-July 2012. A total of 395 cases were included. The cases were maximum in the month of August and minimum was noticed in January<sup>17</sup> while in our study maximum incidence was seen in May and minimum in January.

In a study conducted in by Rai, *et al*<sup>18</sup> a clear seasonal variation was observed in the incidences of acute Appendicitis and Appendectomy for both genders. The peak incidence was seen in the summer season and decreased in the winter season. In addition, the present study observed a slight but consistent increase in the incidence of perforated appendicitis in the summer season<sup>18</sup>.

A study was conducted in Taiwan by Lin, *et al*<sup>19</sup> all in 2015. The highest incidence of Appendicitis was found in persons aged 15 to 29 years and males had higher rates of appendicitis than females at all ages except for 70 years and older. Appendicitis rates were 11.76 % higher in the summer than in the winter months<sup>19</sup>.

In a study conducted at Finland by Imre, *et al*<sup>20</sup> in various centres of Finland showed clear correlation of seasonality with acute Appendicitis with increased incidence in summer season.

## CONCLUSION

Acute Appendicitis and its complications is more common in the summer month and is maximum in the month of May. The age group most commonly affected in adults is 18-29 years. The clear association will help in preplanning the management and preventing the incidence of severe complication of the disease. The seasonal variations of acute Appendicitis are consistent with other studies.

**Conflicts of interest :** There are no conflicts of interest.

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