

Impact of COVID-19 Pandemic on Paediatric Appendicitis at a Tertiary Care Paediatric Hospital in New Delhi: A Retrospective Study

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ABSTRACT

Introduction: Across the globe the healthcare system was severely affected by Coronavirus Disease-19 (COVID-19) pandemic. Measures taken to curtail the spread of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) virus have severely affected the paediatric patients presenting with Acute Appendicitis (AA).

Aim: To assess the impact of COVID-19 on paediatric Acute Appendicitis patients at tertiary care center in New Delhi.

Materials and Methods: This retrospective study was conducted at Chacha Nehru Bal Chikitsalaya, New Delhi. Patient demographics, symptomatology including delay in presentation to hospital, haematological, intraoperative findings and complications of all paediatric AA patients who underwent appendectomy from 23rd March 2020 to 22nd July 2020 (Pandemic Group- PG group) were recorded. Patients presenting in corresponding time period in the year 2019 was also compared {Non Pandemic Group (NPG)

group}. Group comparisons for continuously distributed data were made using Independent sample t-test. For non normally distributed data, non parametric tests in the form of Wilcoxon test was used. Chi-squared test was used for group comparisons for categorical data.

Results: A total of 72 patients were included with 39 in NPG and 33 in PG group, respectively. There were no significant differences between the two groups in terms of age (p -value=0.759) and sex distribution (p -value=0.93). Patients in PG group had higher leukocyte counts as compared to NPG group (16748.48 ± 7744.08 vs 12510.26 ± 7736.58 , p -value <0.007). There was no significant difference in delay in presentation, symptomatology, duration of hospital stay and postoperative complications rate between the two groups.

Conclusion: There has been no significant change in the number of patients presenting with AA and the symptomatology during COVID-19 pandemic.

Keywords: Acute appendicitis, Children, Coronavirus disease-19, Severe acute respiratory syndrome coronavirus-2

INTRODUCTION

With the emergence of Coronavirus Disease-19 (COVID-19) pandemic, there has been an unintended consequence on other health conditions. Many countries applied nationwide lockdown to control the spread of disease [1]. India's first lockdown began on March 23, 2020 and continued for six months with phases of relaxation. During the pandemic, there has been a drastic decrease in the number of non COVID-19 patients attending the Emergency Department. The collateral damage due to various logistics problems as well as suspended emergency care in hospitals, had severely affected the emergency care received by paediatric surgical patients. Delay in seeking care has leads to increased mortality and morbidity [2].

Children suffering with AA have been affected most, as AA is one the most common abdominal emergencies affecting paediatric patients [3,4]. In case of AA in children, an early surgical treatment can prevent complications such as appendicular perforation and other postoperative complications. Delay in diagnosis of AA leads to an increased risk of peritonitis, abscess formation, sepsis, wound infection, and bowel obstruction. Generally, appendicular perforation occurs 3 to 5 days after the onset of symptoms, and its rate in children aged 10-17 years is around 20% [5]. Abscess formation rate in children with perforated appendicitis is approximately 20% [6]. During COVID-19 pandemic, it is expected that patients receive medical care at a later stage of the disease and present with significant complications. This study aimed to assess the impact of COVID-19 on the time elapsed between onset of symptoms to the diagnosis of AA and also the effect of delayed presentation on length of hospital stay and postoperative complications.

MATERIALS AND METHODS

This was a retrospective study conducted at Chacha Nehru Bal; Chikitsalaya, New Delhi a tertiary care paediatric surgery centre in New Delhi, India. Approval was obtained from Institutional Ethical Committee (F.1/IEC/CNBC/13/09/2020/84/17210). A retrospective chart review of all patients who underwent open appendectomy from 23rd March 2020 to 22nd July 2020 was done (PG group). Patients with incomplete records were excluded from the study. As it was intended to compare with non COVID-19 period, a similar cohort from 23rd March 2019 to 22nd July 2019 was taken (NPG group).

Data on patient demographics, clinical history, haematological and radiological features and outcome were collected. Clinical history was thoroughly reviewed and time from onset of symptom till the surgery (delay) was noted. The operative notes review included presence of intraperitoneal collection, appendicular and cecal gangrene which were referred as complicated AA. Other clinical course markers were collected including length of hospital stay, need for any bowel diversion and Surgical Site Infection (SSI). Haematological parameters review included Total Leucocyte Counts (TLC), C-Reactive Protein (CRP), serum creatinine, blood and pus culture.

STATISTICAL ANALYSIS

Data were coded and recorded in MS Excel spreadsheet program. The Statistical Package for Social Sciences (SPSS) for windows software version 23.0 (IBM Corp.) was used for data analysis. Descriptive statistics were elaborated in the form of means/standard deviations and medians/Interquartile Range (IQRs) for continuous variables, and frequencies and percentages for categorical variables. Group comparisons for continuously distributed data were made

using independent sample t-test when comparing two groups. If data were found to be non normally distributed, appropriate non parametric tests in the form of Wilcoxon test was used. Chi-squared test was used for group comparisons for categorical data. In case the expected frequency in the contingency tables was found to be <5 for >25% of the cells, Fisher's-exact test was used instead. Statistical significance was kept at p-value <0.05.

RESULTS

A total of 72 patients met the inclusion criteria; among them 39 were in NPG group and 33 were in PG group. There were no significant differences between the two groups in terms of age (p-value=0.759) and sex distribution (p-value=0.93). Abdominal pain was the most common symptom followed by fever and vomiting. The number of patients with delayed presentation did not vary significantly between the two groups [Table/Fig-1].

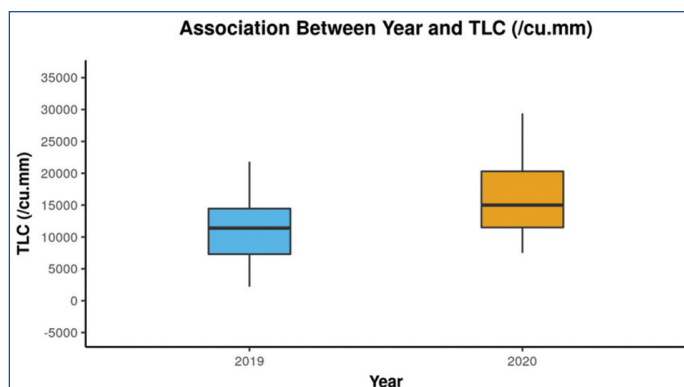
Parameters	Year		p-value
	NPG (n=39)	PG (n=33)	
Age (years)	7.08±2.57	6.83±2.75	0.759*
Gender			
Male	28 (71.8%)	24 (72.7%)	0.930 [†]
Female	11 (28.2%)	9 (27.3%)	
Duration of hospital stay (Days)	8.13±6.44	8.94±5.79	0.397 [‡]
Delay in presentation (Days)	3.56±2.25	4.94±5.69	0.683
Symptoms: ∞			
Fever (Present)	28 (71.8%)	25 (75.8%)	0.704
Pain abdomen (Present)	39 (100.0%)	31 (93.9%)	0.207
Vomiting (Present)	27 (69.2%)	28 (84.8%)	0.120
Diarrhoea (Present)	2 (5.1%)	3 (9.1%)	0.655
Rebound tenderness (Present)	6 (15.8%)	7 (21.2%)	0.556
Tenderness (Present)	36 (92.3%)	29 (87.9%)	0.695
Heart rate (BPM)	107.89±16.89	111.45±15.92	0.364
Haematological parameters			
Haemoglobin (g/dL)	11.65±1.62	11.04±1.92	0.331
TLC (/cu.mm)	12510.26±7736.58	16748.48±7744.08	0.007
Haematocrit (%)	35.11±4.48	33.88±4.95	0.646
CRP (mg/L)	135.33±120.66	173.33±115.28	0.183
BUN (mg/dL)	27.49±14.21	25.21±12.85	0.466
Serum creatinine (mg/dL)	0.36±0.11	0.37±0.13	0.923
Serum sodium (mEq/L)	133.23±4.39	131.67±3.99	0.118
Serum potassium (mEq/L)	4.11±0.51	4.32±0.62	0.138
Pus culture (Positive)	22 (59.5%)	23 (69.7%)	0.372
Blood culture (Positive)	1 (2.7%)	3 (9.1%)	0.337
SSI (Present)	21 (53.8%)	17 (51.5%)	0.844
Peroperative: Free fluid (Present)	2 (5.1%)	8 (24.2%)	0.036
Peroperative: Perforated appendix (Present)	21 (53.8%)	23 (69.7%)	0.169
Ileostomy (Required)	0 (0)	5 (15.2%)	0.017

[Table/Fig-1]: Association between year and parameters (N=72).

*Student's t-test, [†]Fischer-exact test, [‡]Wilcoxon Test, £; SSI: Surgical site infections; TLC: Total leucocyte counts; BUN: Blood urea nitrogen; CRP: C-reactive protein p-value <0.05 considered significant

There was a significant difference in mean total leukocyte counts between both the groups p-value=0.007 [Table/Fig-2]. A 9.1% of patients in PG had growth in blood culture as compared to only 2.7% in non pandemic period (p-value=0.337) [Table/Fig-1].

Cecal gangrene was seen in five patients in PG. All of these patients required small bowel diversion. None of the patients in NPG had cecal gangrene (p-value=0.017).



[Table/Fig-2]: Association between year and TLC (/cu.mm).

The Box-and-Whisker plot below depicts the distribution of TLC (/cu.mm) in the 2 groups. The middle horizontal line represents the median TLC (/cu.mm), the upper and lower bounds of the box represent the 75th and the 25th centile of TLC (/cu.mm) respectively, and the upper and lower extent of the whiskers represent the Tukey limits for TLC (/cu.mm) in each of the groups

The median (IQR) of duration of hospital stay (days) in the non pandemic year was 6 (4-10.5) days which was less as compared to pandemic year in which it was 7.5 (4.75-13) days. However, this difference was not statistically significant (W=550.500, p-value=0.397).

DISCUSSION

The Acute Appendicitis (AA) is one of the most common paediatric surgical emergencies [3,4]. Studies from different parts of world have found that the number of paediatric surgical emergencies had significantly decreased during the initial pandemic phase [7,8]. Various reasons have been cited to explain this reduction in number of cases. Some authors proposed that many patients could not reach the paediatric surgical centres and were treated conservatively [9]. It has also been proposed that the decreased exposure to other infectious agents due to lockdown might be a contributory factor in reduction of incidence of AA. In this study, 33 patients of AA were operated during the pandemic times which were although less but comparable to 39 patients in non pandemic times. It was observed that during the pandemic, most of the paediatric surgery centres in were converted to dedicated COVID-19 centre and their non COVID-19 patients were referred to the centre where study was conducted. This could be one of the reasons for similar number of cases in both the groups.

In this study, the male to female ratio was similar in both PG and NPG group. However, Zhou Y and Cen LS reported male preponderance in patients with AA during the pandemic times [10]. There was no change in symptomatology of AA during COVID-19 pandemic. Abdominal pain was the most common presentation in this study followed by fever and vomiting. In their study, Gerall CD et al., found that fever was significantly more common in population presenting during pandemic period [11]. They also reported that duration of symptoms was longer in pandemic times and opined that fear of visiting the hospital may be the reason for this delay. In the present study, the average delay in presentation was more in PG group as compared to NPG group (3.56±2.25 vs 4.94±5.69 days). On verbal communication with the caregivers, it was found that transport restrictions during the lockdown and fear of exposure to COVID-19 infection in hospital deterred them from seeking hospital care.

In this study, higher rate of perforated appendix in year 2020 (69.7%) was observed as compared to non pandemic year (53.8%). Various other studies done in other parts of world such as Italy, Israel and Colombia supports similar views and results (7,8,12). Snapiri O et al., from Israel found complication rates twice as high (22% vs 11%) when compared to the same time period in 2019, with various complications like perforation and appendicular abscess [8]. Romero J et al., from American University of Radiology also found that Computed Tomography (CT) done during pandemic times found more severe appendicitis cases compared to previous

year [12]. It was also observed that mean leucocyte counts were much higher in PG group as compared to NPG group. There was also higher rate of dyselectrolytemia, CRP values and positive blood and pus cultures in patients presenting during pandemic times. Zhou Y and Cen LS also published similar results with higher TLC counts and also high neutrophil ratio in Chinese population suffering from AA [10]. These markers indirectly suggest increased severity of disease during COVID-19 pandemic. In our country, patients take primary treatment from neighbourhood general practitioners for abdominal pain and fever where they are usually prescribed antibiotics and anti-inflammatory drugs. During the lockdown period these consultations were not available and authors believe that this could have contributed to patients presenting with more severe illness during the pandemic.

The need for ileostomy was significantly higher during the pandemic times which were mostly due to the more complicated cases presenting in later stage of disease with cecal gangrene. Data on this aspect has not been published, so this study results could not be compared. Higher rate of ileostomy could be due to poor nutritional status in developing countries like ours, propelling a surgeon to choose ileostomy (being a safer option).

Duration of stay in hospital was found to be higher during the pandemic times compared to non pandemic times in our study, though it was not statistically significant. Other authors have found statistically significant higher duration of stay in the pandemic times and reason being the more complicated cases operated during these times which needed more time to stabilise. Present study population was less and it was felt that studies with large sample size is required to reach a better conclusion. Gerall CD et al., did a multivariate analysis in their study, and found that duration of stay and number of days until symptom resolution remained significantly longer during the pandemic, further suggesting that the severity of disease patients presented with correlated outcomes [11].

Limitation(s)

There are few limitations of the present study. The retrospective monocentric design of this study makes it difficult to generalise our

results. Due to missing data this study is not able to determine the exact incidence of the disease.

CONCLUSION(S)

During COVID-19 pandemic the management of non COVID-19 paediatric diseases were severely affected. The present study showed no significant change in number of patients presenting with AA and the symptomatology. The delay in access to primary treatment facility for patients with AA has lead to increased severity of the disease.

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