A Comparative Study to Assess the Impact of Covid-19 Lockdown on the Incidence of Acute Complicated Appendicitis in a Tertiary Care Center in Kanchipuram

Dr. Rajakeerthana D MS, Prof. P Ragumani MS, Dr. Imran Thariq Ajmal MS
1General Surgery, Final Year Postgraduate, 2Professor and Chief, 3Chief, 1,2,3Chettinad Hospital And Research Institute

*Corresponding Author:
Prof P Ragumani MS
Professor And Chief, Chettinad Hospital And Research Institute

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract
Millions of people's health has been harmed by the onset and rapid spread of the COVID-19 virus, as well as the subsequent pandemic, both directly through infection and indirectly through a variety of causes that have resulted in delayed treatment of non-COVID related pathologies. World's attention and much of the healthcare industry were focused on the novel virus, other, more recognised pathologies did not wait. While the Government of India implemented a lockdown on 24th March 2020 for preventing the spread of novel corona virus, it prevented deaths due to corona virus, although it had its impacts on common surgical conditions leading to complications; Acute abdomen occurs for 7–10% of all visits to the emergency room. Acute appendicitis is one of the most prevalent causes of lower abdominal pain that leads to visits to the emergency room, and it is the most common diagnosis given to young people who are brought to the hospital with an acute abdomen. In the initial weeks of the COVID-19 pandemic, Tankel et al. reported a 40.7 percent drop in the weekly incidence of acute appendicitis, presenting across many centres in Israel. This study aims to show one of the effect of covid 19 pandemic on common surgical emergency and can be used to create awareness during the further waves of the Pandemic. We analysed data from first wave of Corona virus Pandemic from March 24 for a period of 9 months, and compared it to a similar period before Pandemic; The results were, 26.9% of pre covid appendicitis patients had complications 48.2% of the post covid appendicitis patients had complications; This demonstrates a 21.3 % increase in the incidence of complicated appendicitis

Keywords: Lockdown, Corona Virus, Appendicitis, Pandemic

Introduction
The Indian government implemented nationwide lockdown on 24thMarch2020 limiting movement of 1.3 billion population to prevent the spread of novel corona virus; This lockdown had averted deaths due to covid 19, but has its impacts on non-covid patients during the pandemic; Acute abdomen occurs for 7–10% of all visits to the emergency room. Acute appendicitis is one of the most prevalent causes of lower abdominal pain that leads to visits to the emergency room, and it is the most common diagnosis given to young people who are brought to the hospital with an acute abdomen.
Many problems in acute appendicitis occur as a result of delayed or even missed diagnosis. Because of a characteristic aspect of appendicitis—the quickness with which the inflammation goes through the various stages—every patient could be affected. A gangrenous appendicitis with impending overt perforation might develop even within a few hours. (3)

When compared to non-perforating Acute appendicitis, appendiceal perforation is related with greater morbidity and mortality. Acute but not gangrenous acute appendicitis has a mortality risk of less than 0.1 percent, but gangrenous appendicitis has a risk of 0.6 percent. Perforated Acute appendicitis, on the other hand, has a higher mortality risk of roughly 5%. An inflamed appendix or periappendicitis without symptoms of necrosis or perforation, as documented by the surgeon and pathologist, was classified as uncomplicated appendicitis.

Inflammation of the appendix with gangrene, apparent necrosis, or perforation, as characterised by the pathologist, and/or appearance of perforation or abscess formation, as described by the surgeon, were considered complicated appendicitis.

**Acute Appendicitis :**

1. It is defined as acute inflammation of appendix
2. It is an important public health problem
3. The Incidence of acute appendicitis is 8.6% for men and 6.7% for women;

**ICD 10 code for Appendicitis :** (5)

The International Classification of Diseases is a system that is used to classify, diagnose and code diseases internationally;

It defines Appendicitis as follows:

**Metiology:**

1. It occurs as a result of Luminal obstruction due to,
2. Lymphoid hyperplasia in children
3. Fecalith, Fibrosis, Foreign body- food, parasites, stones, malignancy

**Pathophysiology :**

Closed-loop obstruction → Intraluminal pressure increases → Mucosal ischemia → Luminal bacterial overgrowth → inflammation and ultimately necrosis →

**Stages :**

1. Early stage- 4-6 hours
2. Suppurative stage
3. Gangrenous stage
4. Perforated stage
5. Phlegmous/ abscess

An inflamed appendix or periappendicitis without symptoms of necrosis or perforation, as documented by the surgeon and pathologist, was classified as uncomplicated appendicitis.

Inflammation of the appendix with gangrene, apparent necrosis, or perforation, as characterised by the pathologist, and/or appearance of perforation or abscess formation, as described by the surgeon, were considered complicated appendicitis. (4)
Diseases of appendix (K35-K38)

K35    Acute appendicitis

K35.2    Acute appendicitis with generalized peritonitis

Appendicitis (acute) with generalized (diffuse) peritonitis following rupture or perforation

K35.3    Acute appendicitis with localized peritonitis

Acute appendicitis (with or without perforation or rupture) with peritonitis:

- NOS
- Localized

Acute appendicitis with peritoneal abscess

K35.8    Acute appendicitis, other and unspecified

Acute appendicitis without mention of localized or generalized peritonitis

K36    Other appendicitis

Incl.: Appendicitis:

- Chronic
- Recurrent

K37    Unspecified appendicitis

K38    Other diseases of appendix

K38.0    Hyperplasia of appendix

K38.1    Appendicular concretions

Faecalith
Stercolith

of appendix

K38.2    Diverticulum of appendix

K38.3    Fistula of appendix

K38.8    Other specified diseases of appendix

Intussusception of appendix

K38.9    Disease of appendix, unspecified

Symptoms:

1. Pain around the umbilicus
2. Shifting to the right iliac fossa
3. Loss of appetite
4. Nausea

Signs:

1. Fever
2. Tenderness in the right iliac fossa
3. Rebound tenderness
4. Guarding

Complications: Perforated and gangrenous appendicitis, appendicitis with abscess/phlegmon formation, peritonitis
Aim: To estimate the proportion of patients presenting with complicated appendicitis in General surgery OPD

Objective: To determine the number of patients who presented with Acute appendicitis before and after the COVID-19 restrictions, and the proportion of patients who had severe acute appendicitis as determined by surgical diagnosis.

Materials And Methods:

Study type – Retrospective

Study design – Cross sectional study

Study setting – Chettinad hospital and Research Institute, Department of General Surgery

Duration of study- 18 months, October 2019 to December 24th, 2020.

Inclusion Criteria: All cases of acute and complicated appendicitis

Exclusion Criteria: Subacute and chronic appendicitis, Neoplasms of appendix

Method Of Study:

The study design is a retrospective cohort study

We used the International Classification of Diseases (ICD-10) diagnosis codes (Appendix A) for uncomplicated and complicated (defined as perforation of the appendix, gangrenous appendicitis, and/or abscess/phlegmon) acute appendicitis to identify all adult and paediatric admissions from October 2019 to December 24th, 2020.

The study's primary goal was to determine the number of patients who presented to our institution with acute appendicitis before and after the COVID-19 restrictions, and the proportion of patients who had severe acute appendicitis disease as determined by surgical diagnosis.

Statistical Analysis:

Data Analysis: Statistical Package for Social Sciences (IBM-SPSS)

Normality of data assessed before applying tests of significance

Qualitative variables calculated with chi square test

Quantitative variables described as mean and standard deviation

Quantitative variables described in proportions

Significance of p value \( p < 0.05 \)

There were two time periods: 9 months before the pandemic (Group A: October 2019-20 March 23) and 9 months after the pandemic (Group B: March 24, 2020–December 2020). We examined a longer period to see if any potential difference was ascribed to COVID-19 rather than temporal or seasonal changes.

The age of the patient, sex, associated comorbid conditions, symptoms, MANTREL score, duration of symptoms, radiological imaging, and laboratory investigations were all obtained.

The kind of treatment (surgery, intravenous antibiotics), the time from presentation to surgery, intraoperative time, postoperative diagnosis, duration of hospital stay, postoperative complications, and patient disposition following discharge from the hospital were all recorded.

A comparison was performed between the clinicopathological features of the patients in each group to arrive at the incidence of complicated appendicitis in both groups and see if there is any significant increase post the covid-19 pandemic in our institution;

The collected data was entered in the Microsoft excel spread sheet as group A and group B;

Group A: Pre covid 19 pandemic study group

Group B - covid 19 pandemic group

Tools Used For Assessment:

1. We collected data and entered it in the Microsoft excel spread sheet
2. Univariate analysis – categorical data were represented as percentage and proportion
3. Continuous data represented as mean with standard deviation
4. Bivariate analysis associate found with chi square test
Images of patients who presented with Complicated Appendicitis during the first wave of the COVID-19 Pandemic

**Perforated Appendix**

![Image of Perforated Appendix]

*Image taken from General Surgery OT, Chettinad hospital and Research institute*

**Appendiceal Abscess**

![Image of Appendiceal Abscess]

*Image taken from General Surgery OT, Chettinad hospital and Research institute*

**Post Op Wound Complications In Ruptured Appendiceal Abscess**
Results

Frequency Table

<table>
<thead>
<tr>
<th>case_vs_control</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid case</td>
<td>29</td>
<td>35.8</td>
<td>35.8</td>
<td>35.8</td>
</tr>
<tr>
<td>controls</td>
<td>52</td>
<td>64.2</td>
<td>64.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>gender_dicot</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid male</td>
<td>51</td>
<td>63.0</td>
<td>63.0</td>
<td>63.0</td>
</tr>
<tr>
<td>female</td>
<td>30</td>
<td>37.0</td>
<td>37.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>81</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
The total number of cases included in the study was 81;
In that control included 52 appendicitis patients in the pre lockdown period, Cases were 29; 1 patient was excluded from the study in the case group due to malignancy;
The study had 51 male patients (63%) and 30 female patients (37%)

**Age Histogram**:

![Age Histogram](image)

<table>
<thead>
<tr>
<th>complication_dicot</th>
<th>case_vs_control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>case</td>
<td>controls</td>
</tr>
<tr>
<td>complicated</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>% within case_vs_control</td>
<td>48.3%</td>
<td>26.9%</td>
</tr>
<tr>
<td>not complicated</td>
<td>15</td>
<td>38</td>
</tr>
<tr>
<td>% within case_vs_control</td>
<td>51.7%</td>
<td>73.1%</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>52</td>
</tr>
<tr>
<td>% within case_vs_control</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

In the Pre-covid control group of total appendicitis patients, 14 patients among 52 cases had complicated appendicitis; this was 26.9%;
But in the study group of appendicitis patients, 14 patients among 30 cases- 48.3 % had complicated appendicitis;
The P Value Is 0.053;

Summary Of Results: 26.9% of pre covid appendicitis patients had complications 48.2% of the post covid appendicitis patients had complications; The P value is 0.053;

Discussion
The total number of appendicitis cases that presented to our hospital during the COVID lockdown had decreased from 64.2% to 35.8%, which is a 28.4% reduction of acute appendicitis patients;

Among those who came, almost half of the acute appendicitis had complications; This could be due to the fact of late presentation; The lockdown restrictions, non availability of transportation, fear of catching COVID-19 virus, non availability due to demand of medical services during the pandemic could all be attributed to the decreasing appendicitis cases as well as the complications arising out of delayed presentation;

Conclusion
1. Patients with acute appendicitis present late to the hospital with higher incidence of complications due to the fear of COVID 19 pandemic;
2. Healthcare providers must create awareness about acute surgical emergencies to prevent the morbidity and mortality associated with these conditions;
3. This also highlights the importance of telemedicine to bring these patients to hospital during the pandemic;

References