



INTUSSUSCEPTION IN CHILDREN AND ITS MANAGEMENT IN VIEW OF COVID 19 PANDEMIC

Dr Shyam Sundar Sahu¹, Dr Vidisa Bose², Dr Abhishek Ranjan^{3*}, Dr Priya Shalini Lakra⁴, Dr Hirendra Birua⁵

ABSTRACT

AIM: To evaluate the management of intussusception in view of COVID 19 pandemic. Intussusception is one of the most frequent causes of acute bowel obstruction in infants and toddlers and probably the second most common cause of acute abdominal pain in infants and preschool children after constipation.

METHODS: We retrospectively reviewed all the patients in our Department admitted between July 2018 to June 2022 who were diagnosed with intussusception and were managed either conservatively or surgically intervened depending upon the clinical condition.

RESULTS: 52 children with intussusception were treated. All the patients had intussusception (detected on Abdominal ultrasound) treated initially conservatively with NPO status, intravenous fluids, nasogastric tube insertion for gut rest and parenteral antibiotics initially and symptoms subsided for 14 out of 52 patients. Pre operative imaging included second confirmatory USG Whole Abdomen in all cases. Thirty five of them underwent open laparotomy of which 3 underwent spontaneous reduction, 17 underwent manual reduction, 8 underwent resection of gangrenous bowel with primary anastomosis and 7 underwent resection of bowel and stoma creation which were closed in 6 months post operatively. Three of them underwent laparoscopic reduction of intussusception. Nasogastric tubes were removed on post operative day-5 after the patient passed stool. Prebiotics probiotics were started after NG tube removal followed by feed from next day. One patient who had resection of gangrenous bowel with primary anastomosis developed an anastomotic leak on POD 7 and underwent re-laparotomy with divided stoma creation. Three patients with poor general condition, delayed presentation and profound bowel gangrene with severe peritonitis expired. Follow up was done for all the discharged patients, all of whom were symptom free and suffered no recurrence.

CONCLUSION: Incidence of intussusception significantly increased in the post COVID 19 era. This is probably due to the poor immunity status of the children due to silent COVID 19 infections.

Keywords- pediatric, intussusception, COVID-19, immunity, surgery

¹MBBS, MS, MCH, Assistant Professor, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

²MBBS,DNB, Senior Resident, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

^{3*}MBBS, MS, MCH, Associate Professor, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

⁴MBBS, MS, MCH, Senior Resident, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

⁵MBBS, MS, MCH, Professor, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

***Corresponding Author :** Dr Abhishek Ranjan

MBBS, MS, MCH, Associate Professor, Department of Paediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand

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INTRODUCTION

The word intussusception is derived from the Latin words *intus* (within) and *suscipere* (to receive). Intussusception is the invagination of one part of the intestine into another. Three cylinders of intestinal wall are involved. The inner and middle cylinders are the invaginated bowel (intussusceptum), and the outer cylinder is the recipient of the invaginated bowel (intussusciens). Intussusception is one of the most frequent causes of acute bowel obstruction in infants and toddlers.⁽¹⁾

Intussusception was recognized as a disease in the late 1600s in Europe (Barbette, Peyer), but Hunter provided the first detailed description of intussusception in 1793.⁽¹⁾

The majority of intussusception cases are classified as primary or idiopathic. The pathological causes

of intussusception predominate over the age of 3 years, with Meckel's diverticulum, intestinal duplication, polyps, and intestinal malignancy being the most common lead points. In some children with acute intussusception, we can manage conservatively and achieve spontaneous reduction and recovery. However, in cases of persistent acute intussusception, which may result in bowel ischaemia and necrosis, requires urgent surgical intervention. Unresolved acute intussusception is an emergency and needs early diagnosis and management with appropriate surgical or non-surgical reduction to reduce morbidity and mortality.⁽²⁾

Approximately 74 intussusceptions occur annually per 100,000 infants worldwide.⁽³⁾ Globally, pediatric intussusception patients with COVID-19 infection have been reported⁽⁴⁾.

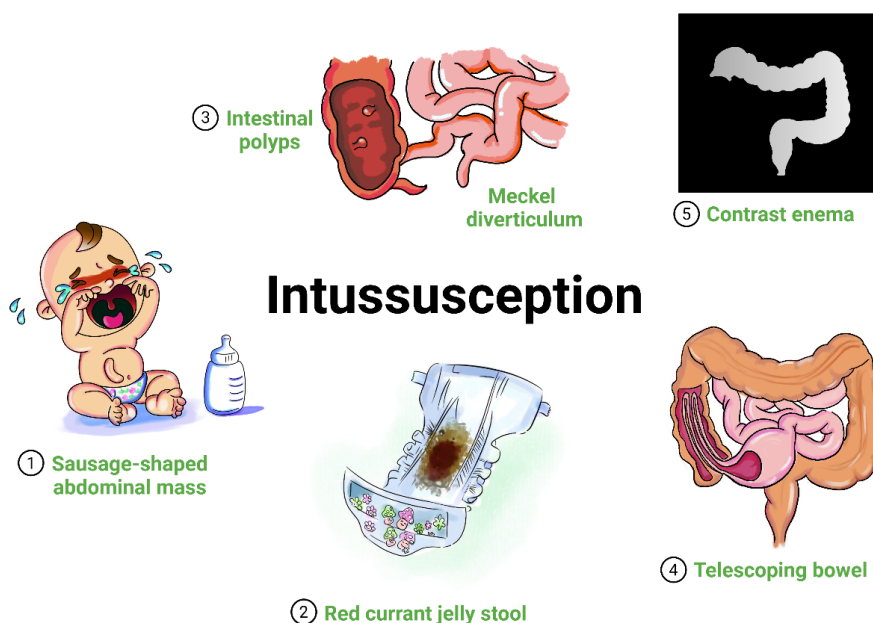


Figure 1. Graphical representation of Intussusception (ISN) in children. ISN classically presents in an infant or toddler (1) sudden onset of intermittent, severe, and progressive abdominal pain and palpable sausage-shaped abdominal mass, and/or (2) red currant jelly stool. ISN may possibly be due to (3) lead points (such as intestinal polyps or Meckel diverticulum). ISN refers to (4) the invagination (telescoping) of a part of the intestine into a more distal segment (proximal segment is known as the intussusceptum and the distal segment into which it telescopes is known as the intussusciens). Radiography findings may reveal a (5) lack of perfusion in the intussusceptum, indicating the development of ischemia.⁽⁵⁾

In this retrospective study, we determined whether the COVID-19 pandemic had an effect on trends in the incidence and management of pediatric patients with intussusception.

MATERIALS AND METHODS

This retrospective study analyzing the different methods of management of idiopathic intussusception in the pediatric population was performed from July 2018 to June 2022 (4 year

duration) on the patients admitted to Department of Pediatric Surgery, Rajendra Institute of Medical Sciences, Ranchi. Children ranging from 3 months to 14 years having clinical features and radiological evidence of intussusception and were hemodynamically stable were first managed conservatively with nil per oral status, IV fluids, IV antibiotics, nasogastric tube insertion and catheterisation for 48 hours.

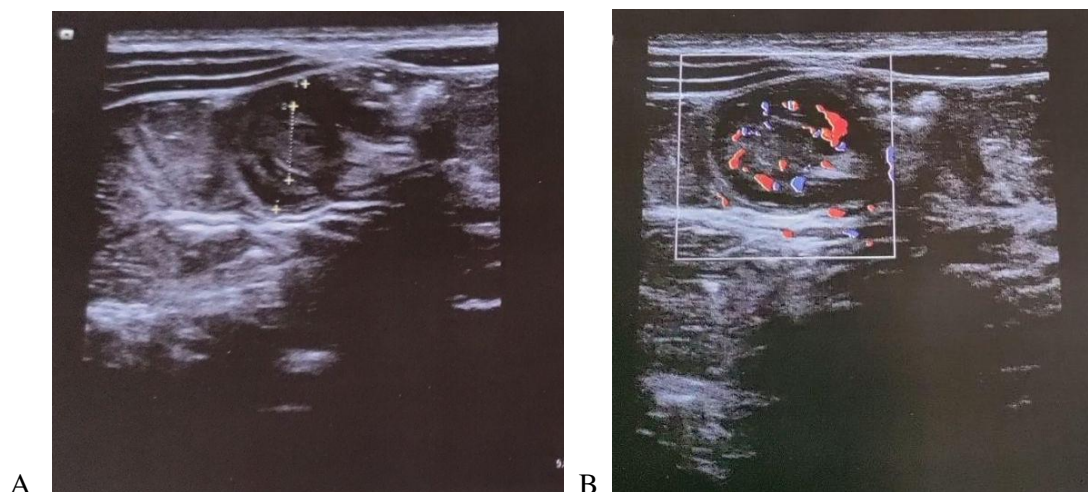


Figure 2: Abdominal Ultrasound images A. Classic ‘whirlpool sign’ confirmatory of intussusception, B. Doppler study showing vascularity

Arterial blood gas analysis, complete blood count, serum electrolytes, urea, creatinine, serology were done routinely anticipating the requirement of operative intervention in near future .

Those patients whose symptoms subsided with conservative management were initially started on prebiotics and probiotics after removal of nasogastric tube. Then oral liquids were started the next day followed by a semi solid diet. If symptoms did not recur, the patient was allowed normal diet as per age and was discharged with oral prebiotics-probiotics , oral antibiotics , oral analgesics and plenty of fluids. The patients were called for follow up in pediatric surgery OPD 7 days and 28 days after discharge.

For those hemodynamically stable patients, whose symptoms did not subside with conservative management were subjected to second time confirmatory abdominal ultrasound . If this USG confirmed the presence of intussusception but no palpable lump was detected , the patient was subjected to diagnostic laparoscopy. But if a palpable lump was detected , the patient was

subjected to open laparotomy. Abdomen was opened by right upper transverse incision, meticulous inspection was carried out throughout the entire length of the bowel from duodeno-jejunal junction to rectosigmoid to locate the exact position of the intussusception, associated lymphadenopathy as well as any other associated abnormality.

After locating the intussusception, at first spontaneous reduction was allowed to happen. If it does not succeed, manual reduction was tried with hot mops (to reduce bowel oedema) and milking out the intestine gently and patiently. Post manual reduction, vitality of the bowel was checked , assessed by the color and peristaltic movement of the bowel and lead point of the intussusception was identified. If the color of the bowel was pink and peristaltic movement was intact, peritoneal lavage was done, bowel was placed back in the abdominal cavity, corrugated rubber drain was placed intraperitoneally and abdomen was closed in layers after achieving adequate hemostasis.

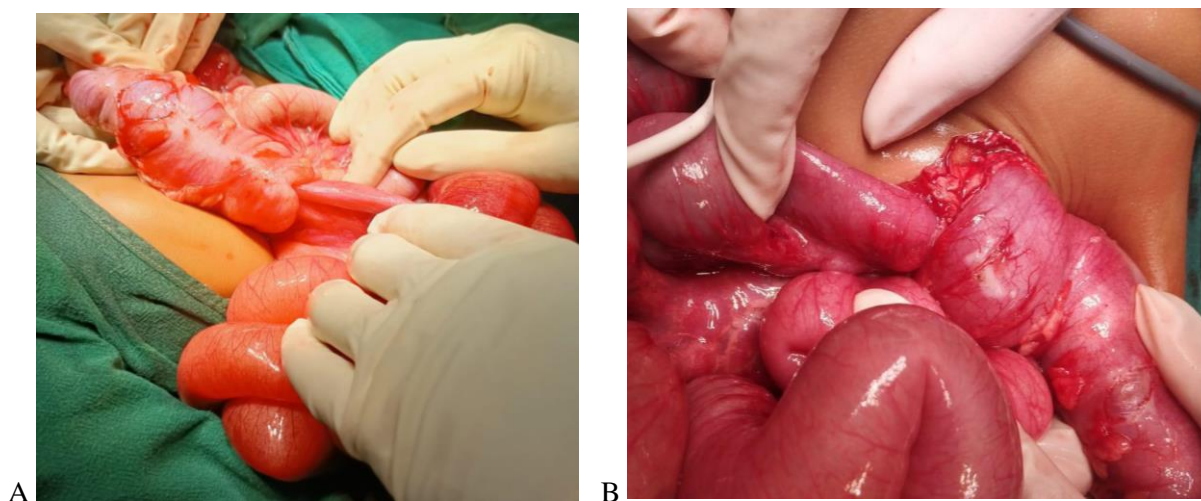


Figure 3: Intraoperative pictures of intussusception which was reduced by manual reduction

If the length of the bowel involved in intussusception was found to be devitalised or gangrenous, the gangrenous part was resected out and depending upon the peritoneal contamination of the patient, decision was made between primary anastomosis and stoma creation. If there was minimal or no peritoneal contamination, primary resection and anastomosis was done between the

healthy ends of the bowel with Vicryl 3-0/2-0 in 2 layers taking interrupted sutures and mesenteric gap, if any was closed. If there was gross peritoneal contamination or the patient was hemodynamically unstable, stoma creation(double barrel stoma/ divided stoma) was done after resecting out the gangrenous bowel.

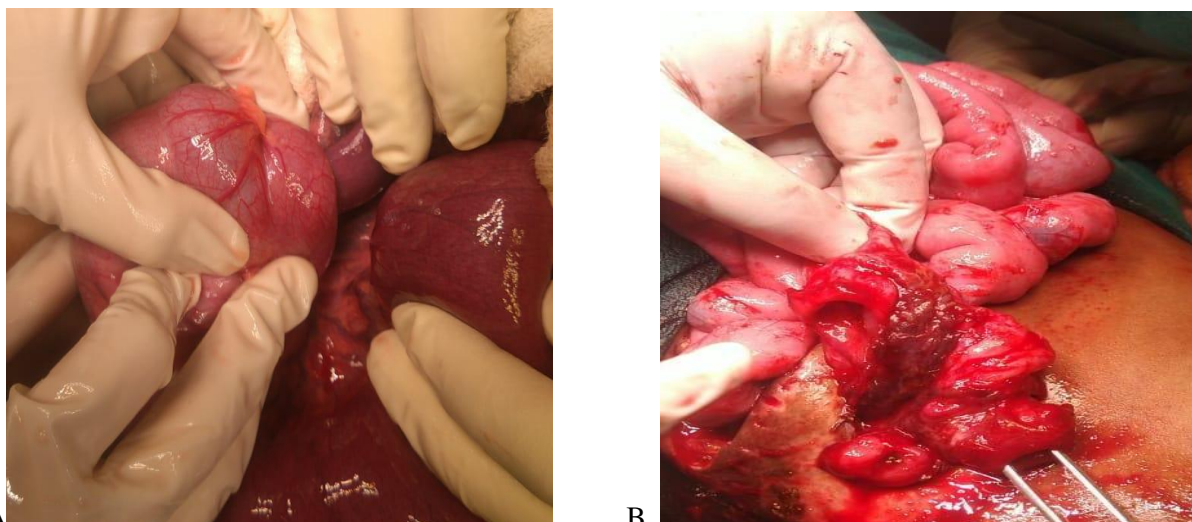


Figure 4: Intraoperative pictures of a patient for whom gangrenous part was resected and double barrel ileostomy was done

In those cases, where the gangrenous bowel was resected out, the specimen was sent for histopathological examination (HPE). The HPE

generally showed inflammatory cell infiltrates and areas of hemorrhage and necrosis

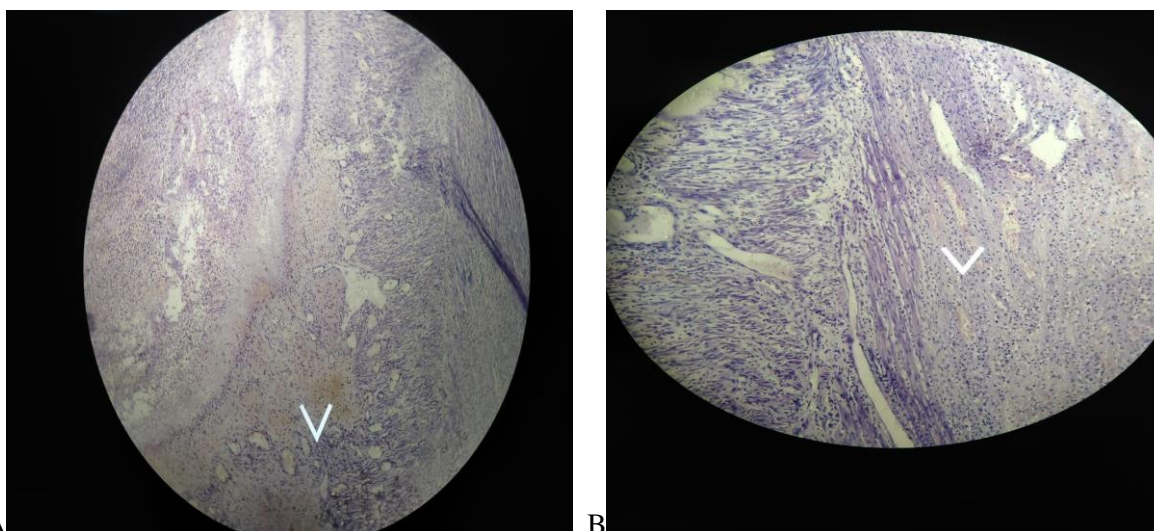


Figure 5: Microscopic view of resected specimen of intussusception : A. Areas of hemorrhage and necrosis, B. Inflammatory cell infiltrates

For those children who were admitted in hemodynamically unstable condition with ultrasound confirmed intussusception, they were first resuscitated with nil per oral status, IV fluids, IV antibiotics, nasogastric tube insertion and catheterisation. These patients were taken up for operative intervention early (within 6 hours of

stabilization of vitals) and all of them underwent open laparotomy for early localisation of pathology and control of the source of sepsis and stoma was done for all of them.

Post operative advice included NPO status, 2 hourly NG aspiration, IV fluid, IV antibiotics, analgesics, catheterisation, and blood products

transfusion depending on the preoperative hemoglobin levels and intra operative blood loss. Nasogastric tubes were removed on post operative day-5 after the patient passed stool. Prebiotics probiotics were started after NG tube removal followed by fluids from next day. If fluids were tolerated well, a semi solid diet was started . If symptoms did not recur, the patient was allowed normal diet as per age and was discharged with oral prebiotics-probiotics , oral antibiotics , oral analgesics and plenty of fluids. The patients were called for follow up in pediatric surgery OPD 7 days and 28 days after discharge.

RESULTS

This retrospective study analyzed the clinical course of patients suffering from intussusception in the pre COVID vs post COVID era . A total of 52 patients were included in the study over a course of 48 months , of which only 4 patients belonged to pre COVID era whereas yearly incidence increased by 4 times after COVID 19 pandemic. Out of 52 patients, 35 were male and 17 were female with M:F=2:1. Majority of patients were less than 3 years old with ages ranging from 3 months to 14 years.

Table 1. Sex distribution of the patients

SEX	NUMBER OF PATIENTS	PERCENTAGE (%)
MALE	35	67.3
FEMALE	17	32.7
TOTAL	52	100

Table 2. Age distribution of the patients

AGE IN YEARS	NUMBER OF CASES	PERCENTAGE(%)
0-3	28	53.9
3-6	14	26.9
6-9	5	9.7
9-12	3	5.7
12-14	2	3.8
TOTAL	52	100

The most common type of intussusception seen in this study was ileo-colic intussusception, followed

by ileo- ileal intussusception and only 2 cases of ileo-ileo-colic intussusception were seen .

Table 3. Type of Intussusception (DETECTED ON USG)

TYPE OF INTUSSUSCEPTION	NUMBER OF CASES	PERCENTAGE
ILEOCOLIC	39	75
ILEOILEAL	11	21.2
ILEO-ILEO-COLIC	2	3.8
TOTAL	52	100

In this study , 14 patients were treated conservatively whereas 38 patients had to undergo

operative intervention when their symptoms did not subside with conservative management.

Table 4. Management protocol

PROTOCOL FOLLOWED	NUMBER OF CASES	PERCENTAGE (%)
CONSERVATIVE	14	26.9
OPERATIVE	38	73.1
TOTAL	52	100

For those 38 patients whose symptoms did not alleviate on conservative management, repeat abdominal ultrasound was done and presence of intussusception was confirmed in all patients who were planned to be taken up for operative intervention. Three patients had no palpable lump

and hence the decision was made to do diagnostic laparoscopy and proceed as per findings. All the three patients had ileo colic intussusception of length < 2 cm which was reduced laparoscopically with meticulous bowel inspection but minimal bowel handling.

Table 5. Type of operation done (N=38)

MODE OF OPERATION	NUMBER OF CASES	PERCENTAGE(%)
LAPAROSCOPIC REDUCTION	3	8.6
OPEN LAPAROTOMY	35	91.4
TOTAL	38	100

Thirty five patients underwent open laparotomy. This included hemodynamically unstable patients as well for whom open laparotomy was the management of choice post stabilisation. Three patients underwent spontaneous reduction of the intussusception when the peritoneum was opened. For remaining patients, manual reduction was done to milk out the intussusceptum from the intussuscepti. After reduction, in 17 patients, the gut was found to be healthy and further intervention

was avoided. In the remaining 15 patients, gut was found to be gangrenous post reduction and was resected. Eight of these patients had minimal peritoneal contamination and hence underwent primary anastomosis. Seven patients had features of generalized peritonitis and the resected ends of the bowel were brought out as either double barrel stoma or divided stoma depending upon the length of the bowel resected.

Table 6. Management done post Open laparotomy (N=35)

MODE OF MANAGEMENT	NUMBER OF CASES	PERCENTAGE (%)
SPONTANEOUS REDUCTION	3	8.6
MANUAL REDUCTION	17	48.6
RESECTION AND ANASTOMOSIS	8	22.8
STOMA CREATION (DOUBLE BARREL/DIVIDED)	7	20
TOTAL	35	100

The most common postoperative complication was surgical site infection , wound dehiscence and anastomotic leak. Majority of the patients suffering from surgical site infection and dehiscence had previously undergone stoma creation and improper stoma care led to increased incidence of SSI. One

patient from the Resection and Anastomosis group had bilious drain soakage in the postoperative period indicating an anastomotic leak. This patient underwent re exploration and creation of Divided Stoma creation.

Table 7. Post operative complication

POST OPERATIVE COMPLICATION	NUMBER OF CASES
SURGICAL SITE INFECTION	7
WOUND DEHISCENCE	4
ANASTOMOTIC LEAK	1
DEATH	3
TOTAL	15



Figure 5. A & B. Peristomal excoriation and wound dehiscence due to poor wound and stoma care

Three patients with poor general condition, delayed presentation and profound bowel gangrene with severe peritonitis expired. All three of them

had Stoma creation due to profound peritonitis and massive bowel gangrene.

DISCUSSION

Intussusception is a common emergency in infants and children. Abdominal ultrasonography is the primary diagnostic tool in the work up of intussusception, because of its high specificity and sensitivity, and the absence of radiation exposure.⁽⁶⁾ This 48 month long study showed a 4 times increase in the incidence of intussusception after COVID 19 pandemic as compared to pre-COVID 19 era. Bazuaye-Ekwuyasi EA et al stated in their study that although the pathogenesis of COVID-19-related intussusception is not fully understood, it can be inferred to parallel the other viral associated intussusception cases.⁽⁷⁾

In our study, there were 2 times more male patients than females with the majority of the patients being less than three years old. In a study conducted by Chukwubuike KE et al, there was male predominance and the median age of the patients was 8 months.⁽⁸⁾

Seventy five percent of our study population had ileocolic intussusception detected on abdominal ultrasound. In a study conducted by Sonmez K et al, ileocolic intussusception is the most common type, comprising more than 76.1% of cases.⁽⁹⁾

Thirty eight out of fifty two patients had to undergo operative intervention, of which three patients underwent laparoscopic reduction and remaining underwent open laparotomy. Spontaneous reduction was achieved in 8.6% patients, 48.6 % patients required manual reduction, 22.8 % needed resection and anastomosis and the remaining needed stoma creation. In a study conducted by Ghritlaharey RK et al, during operative procedures, gangrenous bowel segments were documented in 46.22% children. Sixty-two percent of children required bowel resections for the management of intussusception. It was possible to reduce intussusception in 38% children, and formal bowel resections were not required. Half of them had a serosal tear, minor perforation, or patchy bowel gangrenes, which were managed with serosal tear repair or bowel repair⁽¹⁰⁾

The most common postoperative complication was surgical site infection (SSI), wound dehiscence and anastomotic leak. There were three deaths in this study, attributed to poor general condition, delayed presentation and profound bowel gangrene with severe peritonitis. In a study conducted by Temesgen F et al, the rate of SSI and wound dehiscence is high in their pediatric surgical population.⁽¹¹⁾

CONCLUSION

Intussusception is one of the most frequent causes of acute abdomen in children. There was a significant increase in the incidence of

intussusception in COVID 19 era owing to asymptomatic infection of the virus in pediatric age group. Emergency surgical interventions are associated with higher rates of complications and mortalities. Moreover, COVID-19 infection can increase the risk of postoperative morbidity and mortality in children in both elective and emergency settings.

Conflict of interest : None to declare

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