

Seasonal Variability and Outcome of Childhood Intussusception; A Single Center Experience

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Abstract

Objective: To evaluate seasonal variability and outcome of intussusception in the pediatric population.

Study type, settings & duration: A Prospective Observational study was conducted in Department of Neonatal and Pediatric Surgery, The Children's Hospital, PIMS, Islamabad for a period of one year from August 2022 to July 2023.

Methodology: After approval from the ethical review committee, the study was conducted in children who presented in the ER and OPD during our study time period, aged between 3 to 18 months and with ultrasound confirmed intussusception. The diagnosis of intussusception was made based on clinical diagnosis and imaging results. All patients diagnosed with intussusception during the study period were included in the study after fulfilling inclusion criteria. The data collected from patients included the age (in months), gender, time interval from symptoms to hospital presentation, presenting symptoms, month patients presented, procedure performed and complications of treatment. Statistical Package for Social Science (SPSS) version 23 was used for data entry and analysis. For the sake of this research, the weather in Pakistan is divided into four seasons: winter (December to February), autumn (September to November), summer including rainy monsoon (June to August) and spring (March to May).

Results: We enrolled 94 patients with mean age was 7.39 ± 3.08 months. Out of 94 patients 58 (61.7%) patients were male and 36 (38.3%) patients were female. In duration from symptoms to hospital presentation 52.1% patients were reported after 48 hours. 44 (46.8%) cases of intussusception were reported in summer season including monsoon i.e. rainy season (June to August), 25 (26.6%) cases were reported in autumn season, 20 (21.3%) cases were reported in spring season and 5 (5.3%) cases were reported in winter season.

Conclusion: Intussusception may occur at any time of year, but the results of current research reveal that an increase in the number of cases of intussusception seen during the summer season, which also includes the rainy monsoon. This covers the months of June through August. In addition, it is seen that delayed presentation is associated with more complicated outcomes, whereas early presentation correlates with fewer complications.

Key words: Intussusception, seasonal variation, target sign.

Introduction

The invagination of a section of the intestine into another part is known as intussusception. The intussusceptum is the area that invaginates,

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Authors Contribution

OF & MAC conceptualized the project. OF did the data collection, statistical analysis, literature search, drafting, revision & writing of manuscript. MAC also supervised and assured the quality.

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and intussusciptien is the area that receives the intussusceptum. Childhood intestinal obstruction caused by intussusception is a prevalent cause of the common paediatric abdominal surgery.¹

Childhood intussusception mostly occurs at the age of 4 to 10 months, with a frequency of 34-100 per 100,000 children. Seasonal variations in intussusception have been reported, and numerous ideas on its aetiology have been put up, but it is still unclear what causes it.²

The most typical symptoms are a palpable abdominal mass, nausea, vomiting, and red currant jelly in the feces. The traditional triad of vomiting, stomach discomfort, and rectal bleeding occurs in one-third of cases. Intussusception is clinically diagnosed, and radiological tests are used to confirm the diagnosis. Despite non-surgical options like fluoroscopic barium enema reduction and pneumatic

reduction, surgery is still a commonly used method for treatment in underdeveloped nations.³

Some research has linked some viruses or bacteria to intussusception. Intussusception may be treated surgically or non-surgically. Intussusception, a medical and surgical emergency, has been linked to seasonal variations in developed nations.⁴ There are few statistics available on the epidemiology of intussusception-related hospitalisations in Pakistan.⁵ Some reports have documented the seasonality of intussusception in children, while others believe that there is no seasonality.^{6,7}

The epidemiological aspects of intussusception, such as seasonal changes, have not yet been studied in underdeveloped nations like Pakistan. This study's objective is to assess the seasonal variability of paediatric intussusception.



Figure-1: Ileocecal intussusception.

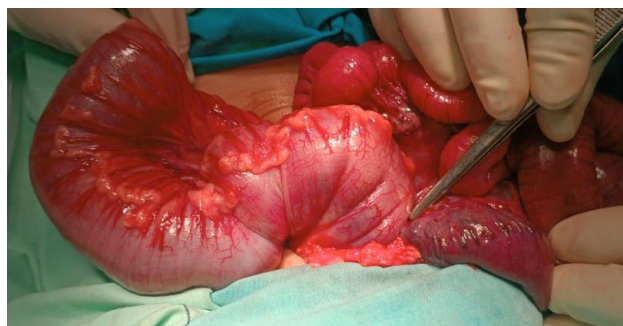


Figure-2: Ileocecolic intussusception.

Methodology

This prospective study was conducted at Children Hospital PIMS Islamabad in 94 children of age 3 to 18 months with ultrasound confirmed intussusception who were admitted through the emergency department of hospital.

The sample size of the current study was calculated by a WHO sample size calculator with a 10% margin of error and a 95% confidence level and taking the anticipated population proportion with intussusception as 42%.⁵

The duration of study was one year from August 2022 to July 2023. Diagnosis of intussusception was made based on clinical parameters and imaging results. Children were enrolled after fulfilling inclusion criteria. Patients with intussusception who could not be confirmed on imaging (ultrasound showing target sign) and patients with pathological lead points were excluded from study.

The information collected included the age (in months), gender, time interval symptoms to hospital presentation, presenting symptoms, month patients presented, procedure performed and complications of treatment. Informed consent from the patient's caregivers was taken. Statistical Package for Social Science (SPSS) version 23 was used for data entry and analysis. Data were expressed as percentages, mean, and standard deviation.

We hypothesize that there is more incidence of intussusception in summer season of the year that includes rainy monsoon.

The ethical approval was obtained from the Ethical Review Board of Shaheed Zulfikar Ali Bhutto Medical University, Islamabad vide letter no. 1-1/2015/FRB/SZABMU/1113.

Results

The ninety four patients fulfilling inclusion criteria, diagnosed with intussusception were enrolled in our study having mean age 7.39 ± 3.08 months.

We analyzed our findings across age (in months), gender distribution, time interval between symptom onset and hospital presentation, presenting symptoms, month of patient presentation, procedures performed, and treatment complications (Table-1).

Table 1: Results of procedure performed and complication in study patients.

Variables		F	%
Procedure performed	Simple reduction without bowel injury	44	46.8
	Difficult reduction with bowel injury	27	28.7
	Incomplete reduction with bowel resection	14	14.9
	Surgical site infection	14	14.9
Complications of treatment	Death	3	3.2
	Wound dehiscence	6	6.4
	Anastomotic leak	6	6.4
	Others	4	4.3

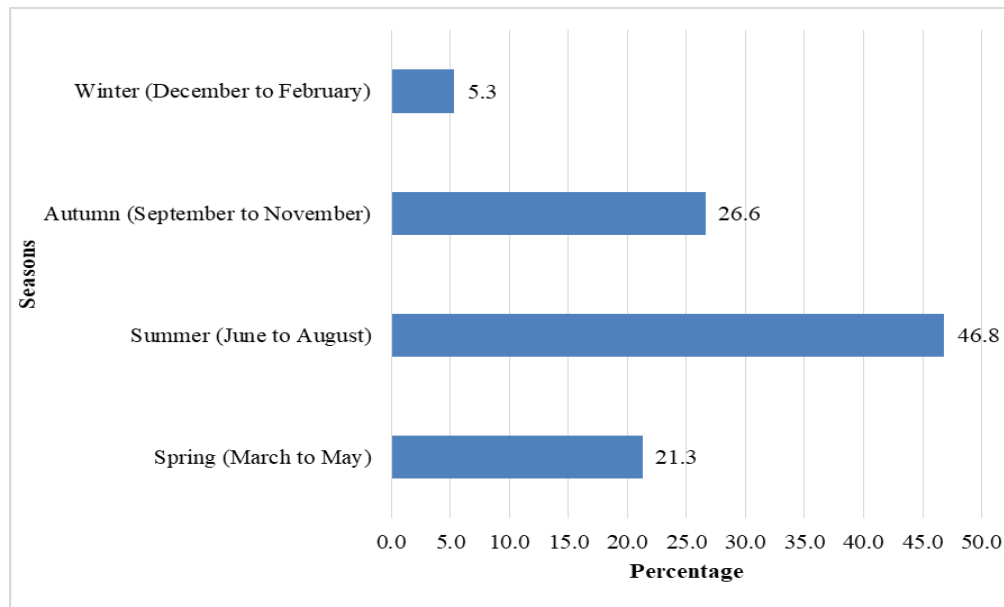


Figure-3: Graphical presentation of intussusception patient's percentage season wise.

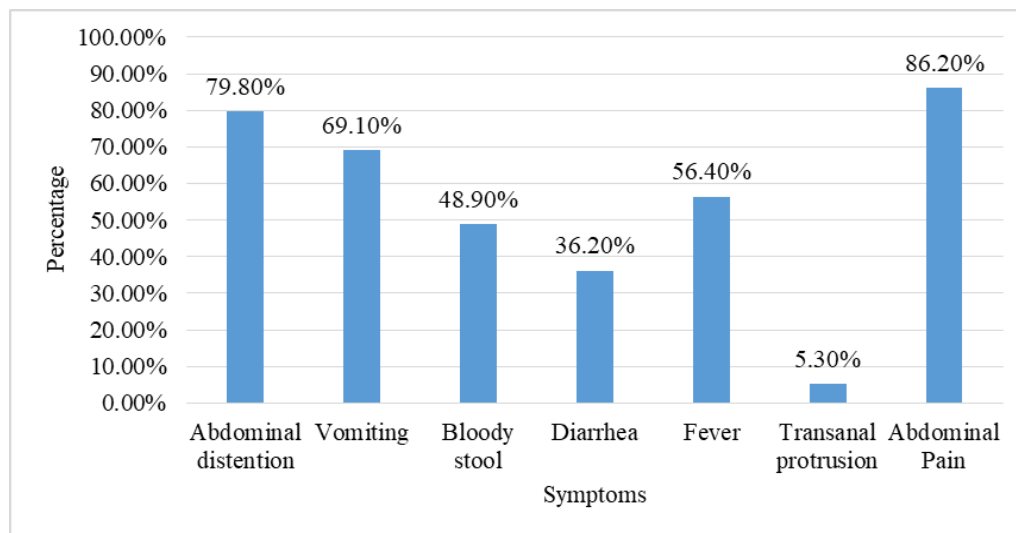


Figure 4: Bar graph of results of presenting symptoms in study patients.

Table 2: Results of gender and duration from symptoms to hospital presentation.

Variables		Frequency	Percent
Gender	Male	58	61.7
	Female	36	38.3
Duration from symptoms to hospital presentation	Within 24 hrs	13	13.8
	Within 48 hrs	32	34.0
	After 48 hrs	49	52.1

Table-2 presents the frequency and percentage of patients with intussusception categorized by gender, along with the duration from symptom onset to hospital presentation. Our study

observed a higher incidence of the disease among male patients. Additionally, a significant number of patients presented late to the hospital, which affected both the management and surgical outcomes of the cases.

Figure-3 shows a seasonal pattern of intussusception with its highest occurrence observed from June to August, coinciding with the summer season in Pakistan, which notably includes the monsoon period characterised by heavy rains. This increase in cases is attributed to a rise in viral outbreaks more commonly upper respiratory tract infections during this wet season, with a majority of patients having a recent history of viral illness.

Most patients were observed to have symptoms such as abdominal pain, distension, and vomiting (Figure-4). Additionally, bloody diarrhea and fever were frequently reported. Only a small number of patients exhibited the protrusion of a telescoped bowel segment through the anus.

It was observed that the majority of patients underwent a straightforward reduction, achieved by gently drawing the proximal intestine out from the distal one. However, a subset of patients experienced more challenging reductions, necessitating the placement of saline-soaked gauzes around the affected intestinal segment. This technique allowed time for edema to resolve, facilitating the gradual unfolding of the telescoped intestine. This technique aims to facilitate a gradual and controlled unfolding of the telescoped intestine, improving the chances of successful reduction without complications.

Ischemia and necrosis can occur in cases of intussusception, particularly when there is prolonged or severe obstruction of blood flow to the affected bowel, resulting in incomplete or failure to reduce the gut, leading to resection and anastomosis or stoma formation.

Some patients experienced post-operative complications, predominantly with incidences of wound infection, while anastomotic leaks or wound dehiscence occurred less frequently.

Discussion

Intussusception incidence may change or vary from the season to season and also from one country to another country. One of frequent surgical emergencies in the pediatric age range, particularly in neonates, is intussusception. This research set out to assess the seasonality of pediatric intussusception. Most of cases of intussusception i.e. 46.8% were reported in summer season (June to August) in current study.

In a study by Chukwubuike et al,⁸ also evaluated the seasonality of intussusception in children in Nigeria. In their study 37.3% patients were females and 62.4% patients were males with age ranged from 3-12 months. While in the current study, 61.7% of patients were male and 38.3% of patients were female with a mean age of 7.39 ± 3.08 months. These results matched with current study results. Chukwubuike et al⁸ also found the most important symptoms were abdominal pain i.e. 98.4%, and we found it 86.2% in the current study. The majority of the patients had surgery and most frequent postoperative consequence was an infection at the surgical site. Overall, the result was favorable. Similarly, current study found same results regarding

postoperative complications and surgery procedures. Chukwubuike et al⁸ reported that most of the cases of intussusception were observed in the dry season from October to March and the current study found it from June to August. The difference may be due to location and single center study. As this is one of most important limitations.

There are more male children than female in current research. Male preponderance was similarly documented in other intussusception datasets.^{9,10} Obiora et al. found that children with the transanal protrusion of intussusception had female prevalence.¹¹ It is unknown why there is a gender difference. Our patients were on average 7.39 ± 3.08 months old. This result is in line with the findings of previous sub-Saharan African research.^{10,12} All of these investigations concur with the previously mentioned peak age range of intussusception in infants of 4 to 10 months.¹³

The gap between time of symptom start and time of admission to hospital demonstrated the patients' delayed presentation. Financial limitations and lack of parental knowledge might be to blame for this tardy presentation.⁸ A persistent problem in the treatment of pediatric intussusception is delayed presentation.¹⁴

The most frequent and persistent symptom among individuals with intussusception was abdominal discomfort. Abdominal discomfort was listed as most frequent sign of intussusception in several published investigations on the condition.^{9,15} According to a study from Vietnam, all of their patients with intussusception complained of abdominal discomfort.¹⁶

Gadisa et al found that approximately one-third of cases occurred between the months of May and July, with the highest peak observed in the month of June, a higher incidence was noted during the months of May to July, marking the onset of the Ethiopian rainy season, with a secondary peak observed in October, which signifies the conclusion of the rainy season, in their research. These results support the findings of the current study, as we also found more cases in wet monsoons during the summer.

An investigation by Das et al.¹⁷ in India found that there were significant relationships between intussusception cases and temperature, like the current study findings. There was a surge throughout the summer, which may be utilised to forecast, identify intussusception early, and recommend patients for the best course of treatment.

In Taiwan, the warmer months (May–October) had more instances of intussusception than the colder months (November–April).¹⁸

Intussusception cases were shown to vary seasonally in Korean infants, peaking in the summer (July–August) and troughing in the winter (February).¹⁹ Among South African children, higher rates of intussusception were seen in the summer and decreased rates in the winter.²⁰

The majority of patients had surgery to address their intussusception. The significant percentage of patients who required surgical treatment may be explained by late presentation and accompanied abdominal distension. Similar observations of a higher proportion of individuals undergoing surgical treatment were reported in other studies on intussusception.^{21,22}

The most frequent post-operative complication noted was an infection at the surgical site. The most prevalent complication after surgical treatment for intussusception was similarly identified by Ogundoyin et al. and Chalya et al. as a surgical site infection.^{21,23} Another study from Pakistan by Abbas et al.²² also reported surgical site infection as the main complication after surgery.

Intussusception can occur throughout the year; however, current research indicates a higher incidence during the rainy season or monsoon in the summer, typically spanning from June to August. We speculate that viral illnesses may precede episodes of intussusception during this period. Furthermore, delayed presentation often leads to a more complicated surgical outcome, whereas early presentation allows for early intervention and typically results in fewer complications.

Conflict of interest: None declared.

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