

# A Study Of Intussusception In Children Admitted In A Medical College Hospital In Central Kerala

Dr. Menon Narayanankutty Sunilkumar <sup>1</sup>,  
Professor, Department Of Paediatrics,  
Amala Institute Of Medical Sciences, Thrissur, Kerala-680555, India

Dr. Steffany Joshy<sup>2</sup>,  
Under Graduate Scholar 2017 Mbbs Batch, Department Of Paediatrics,  
Amala Institute Of Medical Sciences, Thrissur, Kerala-680555, India

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## Abstract

### Introduction:

Intussusception is one of the most commonly seen emergencies in pediatric surgical speciality and also in the routine clinical practise of a paediatrician. The classical symptoms of intussusception (INTUSN) in a child is the presence of intermittent abdominal pain, vomiting, and a particular type of red "currant jelly" coloured stools. The incidence of INTUSN has a varied course and usually starts in a very young age group and may continue to early childhood. Amala Institute of Medical Sciences is a medical college located in the central part of Kerala State and caters to a large population from surrounding districts. The medical college has a tertiary level care Paediatric department and the Paediatric surgery department is efficient in treating any paediatric surgical emergencies. The paediatric department receives many children with various surgical emergencies and INTUSN is common. The prompt diagnosis of INTUSN can prevent the various morbidity and mortality associated with it.

### Aim:

To study the clinical presentation of children at the time of admission, clinical course in the hospital and treatment modalities in children admitted with INTUSN. Also to study the gender difference, age of admission, seasonal variation, association with weaning habits and also specific reference to abnormalities in laboratory parameters in children admitted with INTUSN.

### Materials and methods:

The present medical college based descriptive study was conducted including a total of 63 children who attended the outpatient, inpatient and casualty-emergency departments in Amala Institute of Medical sciences, Thrissur, Kerala, India for a period of one year from June 2018 to 2019. The total duration of the study was for one year study period.

**Results:** The present study revealed a male preponderance of children with INTUSN in 38 boys (60.3%). Age group wise 3 (4.76%) were below the age group of 6 months. 24 (38.09%) were between 1 to 2 years. The majority of children (56%) with INTUSN were from the rural population. The majority of admissions were in the months of April to July (54%). 68% of children presented within 24 hours from the onset of symptoms to the hospital. 96.82% presented with abdominal pain, followed by incessant crying and irritability (93.65%), vomiting and blood in stools in 90.47% and 77.78% respectively. Children with mass per abdomen (59%) with 23% having abdominal distension. There was a past history of INTUSN in 5 (7.93%) children in the age group less than 4 years. Majority had ileo colic type of INTUSN 58 (92.06%). Hydrostatic reduction was done for 90.47% children.

**Conclusions:** A smart clinical judgement, proper abdominal examination and a simple per rectal examination if possible can diagnose INTUSN in most of the situations. Ultrasonography can pick up the INTUSN in the hands of an experienced radiologist and hydrostatic reduction is the commonest modality in the treatment. Majority of the children were discharged on the fourth day 38 (60.31%) There was no mortality in the present study.

**Keywords:** Intussusception, Mass per abdomen, Blood in stools, Intestinal obstruction, Hydrostatic reduction

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## I. Introduction

The term "intussusception" (INTUSN) is defined when one portion of the intestine gets invaginated with another part of the intestine adjacent to this part<sup>1</sup>. Small bowel INTUSN are commoner than involving the

large bowel<sup>2</sup>. There are data showing a peak age of 4 to 9 months age for INTUSN to develop and is seen when complementary feeding is initiated in these babies<sup>3</sup>. INTUSN has a preponderance in male sex(3:1)<sup>1-3</sup>.

Mostly children are susceptible to develop an INTUSN and in most cases the etiology is unknown. But many causes are known in the adult population and in older children. The reasons could be a lymphoid hyperplasia in the intestines especially in younger children and babies. Intestinal polyps, bowel adhesions after surgery or infections of the gastro intestinal tract, tumors of the intestine, Meckel's diverticulum and endometriosis<sup>4</sup> in the adult and adolescents. Other malignant tumors could be ganglioneuroma and hamartomas characteristically seen in Peutz-Jeghers syndrome, an autosomal dominant syndrome. INTUSN is also seen in association with mesenteric or duplication cysts, a subset of patients with vasculitis such as Henoch Schonlein Purpura and disorders of the coagulation cascade can develop sub mucosal hematomas and can result in INTUSN<sup>5</sup>. In all these conditions there is a lead point in the intestine to cause an INTUSN.

The viral and bacterial infections are known to be associated with INTUSN. Many studies have shed light into these findings after an adenoviral infection in children. Human herpesvirus 6 is also known to cause INTUSN. Salmonella species, Escherichia coli organisms, Shigella species or Campylobacter jejuni are some of the bacterial infections causing the gastro intestinal manifestations and associated with INTUSN<sup>6,7,8</sup>. Administration of Rota viral vaccine has been observed to cause INTUSN<sup>9</sup>.

The intestine in an INTUSN has two important parts, namely the proximal part known as intussusceptum (that part of the intestine that prolapses) and the second distal part the intussusciptiens (the part that is in the distal part receiving the intestine). All this happens because of the vigorous peristaltic action of the intestine and in about 10% of the cases of INTUSN there is an anatomic part known as the lead point as a result of which this occurs. It is interesting to find that the stool is described as red currant jelly (**Figure.1**) as there is ischemia in the intestine and there is damage and oedema of the intestinal mucosa causing sloughing of blood and mucous into the intestine<sup>10</sup>.



**Fig 1: Characteristic Red “currant jelly” stool in a case of Intussusception in a 1 year old child in the present study.**

Literature review and teachings from textbook of Surgery mentions that the order of INTUSN is Ileocolic – Most common type(77%), Ileo-ileo-colic, Ileoileal –(12% and 4% respectively) Colocolic (2%). The cases of multiple (1%) and retrograde(0.2%) INTUSN are rare, but seen<sup>11</sup>.

The notable triad of INTUSN a undergraduate or any postgraduate in Surgery should note is the symptomatic triad of red currant jelly stools, pain abdomen and increased vomiting episodes. The vomiting can be bilious or clear initially. And the characteristic feature of blood in stools is seen only 33% of the patients. The baby becomes very irritable during the progression of the trapping of the intestine and severe pain abdomen causes the baby to flex the lower limbs to abdomen and associated incessant crying not consolable with breast feeding or medicines. There has been reports of gangrene of the part of intestine following prolonged ischemia and baby can have fever, sepsis and encephalopathy like status following dyselectrolytemia (hyponatremia)<sup>12</sup>.

The diagnosis of INTUSN is made possible by experience and proper clinical examination of the child and palpation of the abdomen. Always any child presenting with blood in stools carries a higher suspicion of

this emergency surgical condition. INTUSN can be confirmed by following methods: 1) On examination of abdomen, there is a mass palpable in more than 85% cases of INTUSN and there is a typical sausage-shaped mass in the right hypochondrium. The recommendation is to palpate the mass when the baby is quiet in between the spasms of the intestine. This results in the emptiness of the right lower part of the abdomen and standard textbooks of surgery refer it as a "Sign of dance" of the intestine i.e. the emptiness in the right lower quadrant during palpation. 2) A per rectal examination carefully can help the surgeon to feel the intussusceptum and while removing the finger one can also appreciate the red currant jelly stool tickling out of the rectum<sup>10-12</sup>. 3) Imaging studies are the need of the hour, especially the ultrasonography (USG) of the abdomen. Abdominal Xrays with air enema, Barium or contrast enema, assessment of the intestine, Computer Tomography examination of the intestines are the various modalities used<sup>13</sup>.

Many radiology textbooks mention different signs in USG of the INTUSN: 1) the target sign which gives appearance of a round soft tissue mass that contains a radiolucent ring of mesenteric fat within the INTUSN, usually at the head of the INTUSN (**Figure .2**)



**Fig 2: Acute ileocolic intussusception in a 10 month old baby – Right side-Bowel within bowel loop-Target sign in intussusception on ultra sound and second on left side-Pseudokidney sign in the longitudinal axis.**

2) bull's eye sign results as a result of coiling of the proximal part of the intestine within the distal part, 3) pseudo kidney sign which is the similarity of the mass to a kidney in the longitudinal axis 4) The doughnut sign is appreciated by USG as concentric bands arranged as alternating echogenic and hypoechoic areas, mucosa and muscularis layer of the intestines constitute the echogenic area and submucosa of intestine marks the hypoechoic bands 5) Another sign of INTUSN is the crescent in a doughnut sign which refers to the transverse USG appearance of a crescent only on one side of the bowel and is formed by mesentery which is pulled into the INTUSN. Barium enema or with contrast can reveal following signs 1) meniscus sign is designated for a crescent of air inside the lumen of the colon and is outlining the apex of INTUSN 2) coiled spring sign is formed when the Barium passes through the mucosal folds produces a coiled-spring like appearance 3) claw sign (pincer defect or shouldering defect) is due to a convex filling defect caused by the apex of the intussusceptum. Barium enema is the gold standard for diagnosis and also has therapeutic potential for reducing the INTUSN<sup>12,13</sup>.

The treatment of INTUSN is by hydrostatic reduction under USG. Air enema is used and this reduces the need for immediate surgery. Hydrostatic reduction of INTUSN has a success rate of over 83%. Usually the paediatric surgeon waits for 12 hours and repeats the USG to look for any recurrence. There is a chance for recurrence of INTUSN in about 10% of children [14]. During surgery the trapped part of the intestine is squeezed out and if complications such as intestinal perforation or gangrene has occurred then resection surgery/laparoscopy surgery was done along with administration of appropriate antibiotic treatment<sup>14</sup>.

## **II. Materials And Methods**

**Study design:** Hospital based Descriptive study

**Type of study:** Observational study

**Study duration:** 1 year, June 2018 to June 2019

**Study area/location:** Department of Paediatrics in collaboration with Department of Paediatric surgery, Amala Institute of Medical Sciences, Thrissur, Kerala.

**Study population:** 63 children who attended the outpatient, inpatient of the Department of Paediatrics and casualty-emergency, Amala Institute of Medical Sciences, Thrissur, Kerala. were included in the study.

**Sampling procedure:** Convenient sampling was used to select the participants for the study among the study population who suitably fulfill the selection criteria. Written informed consent was obtained from all the participants.

**Inclusion criteria:** All children aged below 12 years and diagnosed having INTUSN by clinical examination and then confirmation by radiological diagnosis of INTUSN attending the outpatient, inpatient and casualty-emergency departments of our medical college hospital were included in the study.

**Exclusion criteria:** Children who were above 12 years of age and having diagnosis other than intussusception were excluded from this study.

**Study tools:**

A standard proforma was used to collect data for the study. Parents of these children were explained about the study on INTUSN and the written consent was taken before including in the study.

**Data collection:** The cases were analysed with special reference to INTUSN. A standard proforma was prepared to collect the information. A standard proforma included age, sex of the children, types of symptoms on admission, clinical course and treatment given. Also a proper history of gender, weaning habits, immunisation schedule, time of admission of these children with INTUSN, socio-economic status of the family (according to the modified Kuppuswamy scale), duration of stay and the treatment outcome were analysed. Relevant investigations including complete Hemogram, serum electrolytes with ESR, USG Abdomen which were done in all these cases with INTUSN were analysed. So a total of 63 children were studied for INTUSN.

**Statistical Analysis**

The collected data was analysed using institutional Statistical Package for Social Sciences (SPSS) 2023 software. Clinical variables were studied and their frequency distribution and percentage analysis was done, then represented as pie chart and bar diagram.

**III. Results**

All cases were seen by the Paediatric surgeon and also discussed in detail about the type of INTUSN and any complications.

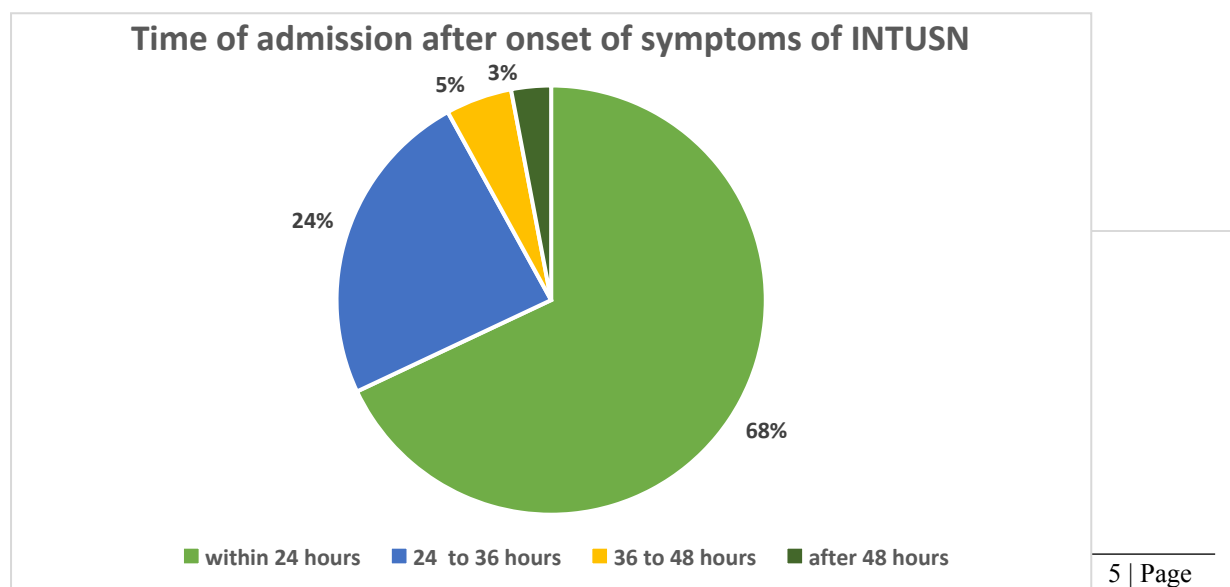
The present study revealed a male preponderance of children with INTUSN in 38 boys (60.3%) and 25 were female children (39.68%).

Age group wise, 3 (4.76%) were below the age group of 6 months, 23 (36.50%) were between 6 months to 1 year old children, 24 (38.09%) were between 1 to 2 years, 4 (6.34%) - between 2 to 3 years, 2 (3.17%) were between 3 to 4 years. In the age group 4 to 5 years, 5 to 6 years, 6 to 7 years, 7 to 8 years, 8 to 9 years, 9 to 10 years, 10 to 11 years, 11 to 12 years one child each i.e. (1.58%) of the total study population (**Table .1**).

Age of child	Frequency	Percent	Male	Female
< 6 months	3	4.76	2	1
6 months to 1 year	23	36.50	16	7
1 to 2 years	24	38.09	15	9
2 to 3 years	4	6.34	2	2
3 to 4 years	2	3.17	-	2
4 to 5 years	1	1.58	1	-
5 to 6 years	1	1.58	-	1
6 to 7 years	1	1.58	-	1
8 to 9 years	1	1.58	1	-
9 to 10 years	1	1.58	-	1
10 to 11 years	1	1.58	1	-
11 to 12 years	1	1.58	-	1
Total	63	100.00	38(60.31%)	25(39.68%)

**Table No 1: Distribution of study population according to age and sex**

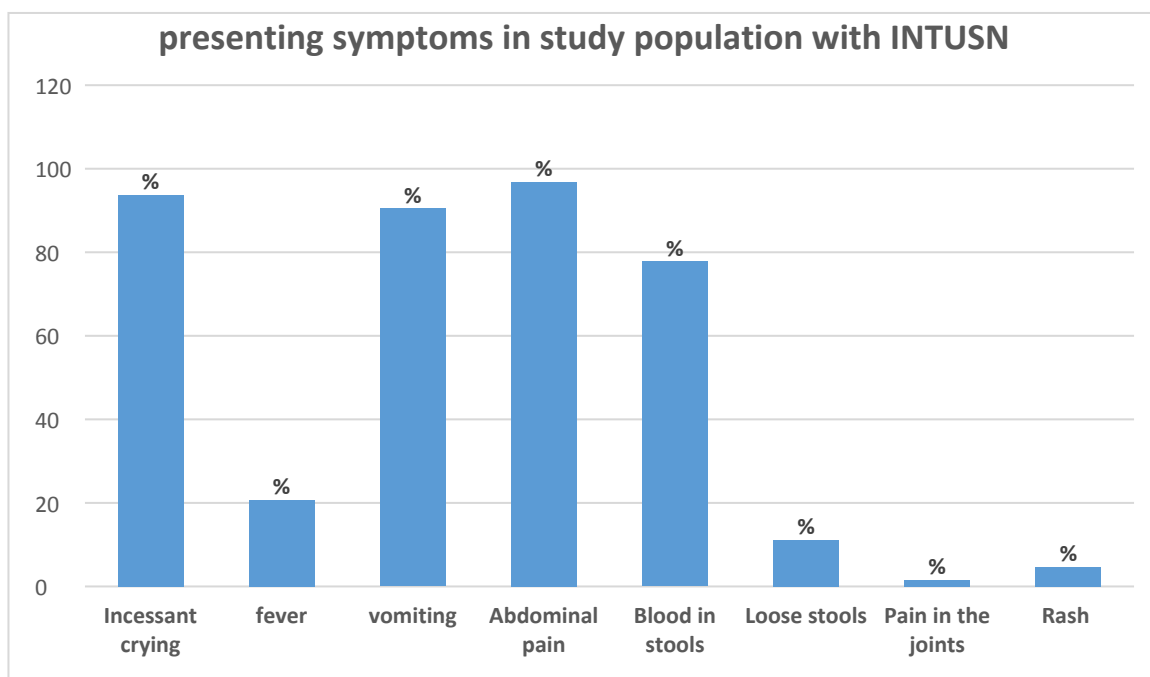
The majority of children(56%) admitted with INTUSN were from the rural population from in and around Thrissur district. More than 60% belonged to the class 3 according to the Modified Kuppaswamy scale. The majority of admissions were in the months of April to July (54%). Regarding the data on time of admissions from the onset of symptoms the children, presented within 24 hours to the hospital (68%), between the first and second day in 24% and the remaining 5 % were brought to hospital in the third and fourth days and 3 % after that period( **Figure. 3**).



**Fig 3: Pie diagram showing category of children based on time of admission after onset of symptoms of INTUSN**

Majority of the babies had exclusive breast feeding (53%), but complementary feeding was found to be started early in the rest of the study population(47%).Bottle feeding was started with supplementary feeding in 28% of these children.Interestingly the population from the urban population (86%) were found to introduce bottle feeding and early complementary feeding in these babies.

Analysis of the presenting complaints in these babies were seen as following :majority of the children presented with abdominal pain(96.82%),followed by incessant crying and irritability (93.65%),vomiting and blood in stools in 90.47% and 77.78% respectively,fever was present in 20.63% and loose stools in 11.11%. Pain in joints (1.57%) and rash in 4.76% children.A child had pain in joints and rash over the extremities with pain abdomen and was diagnosed to have Henoch Schonlein purpura (HSP).A maculopapular rash was present in 2 children who had a viral fever.3 children had acute diarrhoeal diseases and USG was done following fever and vomiting revealed transient INTUSN. A subset of children had the evident mass per abdomen (59%) with 23% having abdominal distension. 7.9 % children presented with an acute viral infection with mild cough and running nose. About 74 % were dehydrated following vomiting and 11 % following loose stools (**Figure 4**). There was a past history of INTUSN in 5 (79.35%) children in the age group less than 4 years.



**Fig.4 Presenting symptoms in present study as percentage**

A routine Hemogram ,ESR( Erythrocyte sedimentation rate) , CRP ( C Reactive protein) and serum electrolytes was done for all children.The majority had normal to mild leucocytosis with polymorphonuclear neutrophils. About 5 children had hyponatremia. In the present study a USG was done for all children and the majority had ileo colic type of INTUSN 58(92.06%). The remaining five children had ileo –ileal type of INTUSN (7.93%).Chest xrays and barium enema was not done in any of the children.A repeat USG was done in all children after 12 to 24 hours(**figure 5**).



**Fig 5: A short intussusception ileo –ileal (in the centre) in a 1 year old child**

All the children were admitted in the paediatric surgery ward. All children were monitored for signs of dehydration, shock, peritonitis and long segment INTUSN crossing from the right hypochondrium to left side by USG. If the child was dehydrated with dyselectrolytemia appropriate fluid correction was given. The hydrostatic reduction was done for all children without any of the above mentioned complications by the paediatric surgeon under USG. Fortunately in the present study only 3 children required open reduction following surgery. 2 children had spontaneous reduction of INTUSN after treating for diarrhoea. One 12 year old child was better after receiving treatment for vasculitis condition –HSP. The other remaining children hydrostatic reduction was done (90.47%) (**Table .2**).

Type of INTUSN	Frequency
Ileo colic	58(92.06%)
Ileo ileal	5(7.93%)
Type of treatment	Frequency
Hydrostatic reduction	57(90.47%)
Surgery	3(4.76%)
Spontaneous reduction	2(3.17%)
Reduction with treatment for HSP	1(1.58%)

**Table 2: Table depicting type of INTUSN and treatment modality given**

The child was sedated and a foleys rubber tube 16 F was inserted per rectum under USG. The warmed Saline solution was pushed into the colon through the rubber tubing by connecting the IV set. The hydrostatic pressure created reduced the INTUSN.

The children admitted with INTUSN was treated according to standard guidelines and sent home by the fourth day after admission. There was no mortality in the present study. Majority of the children were discharged on the fourth day 38(60.31%) . 22 (34.92%) children were discharged on day 3 after admission. The 2 children with diarrhoea and one child with HSP after their illness was treated.

#### **IV. Discussion**

Intussusception is a condition which requires adequate clinical suspicion and appropriate examination of the presenting child is vital in its management. Literature review has shed light on the various aspects of INTUSN especially the male dominance<sup>15</sup>. Male preponderance of children with INTUSN was seen in other studies as well, in our study it was 60.3% and female 39.68%. Weihmiller et al in their study found 67% were males<sup>16</sup>. Bajaj et al and Khan et al also in their historic studies found the male predominance (61% and 64%) respectively<sup>16,17</sup>. Kumar et al found a male predominance 63% in their study<sup>18</sup>.

Age group wise, there are studies showing that neonatal INTUSN are rare<sup>15,19</sup>. In our study 4.76 % were below the age group of 6 months. 36.50 % (6 months to one year), 38.1%(1 to 2 year). Other studies are showing this trend in the prevalence of INTUSN, Justice FA et al found INTUSN to be increased in children below 2 years [12], krishnakumar et al INTUSN more seen less than 3 years<sup>19</sup>.

56% children admitted with INTUSN were from the rural population from in and around Thrissur district. More than 60% belonged to the class 3 according to the Modified Kuppaswamy scale. Majority of the babies had exclusive breast feeding (53%), but complementary feeding was found to be started early (47%). There is a hypothesis that early introduction of complimentary feeds and the lack of adequate breast feeding can jeopardise the maternal immunity required for the babies and can result in INTUSN<sup>20</sup>. The practise of exclusive breast feeding (EBF) and the effective implementation of the various strategies promoting EBF has shown a protective effect in smaller babies. The swelling of the Payers patches and the resultant lymphoid hyperplasia by introduction of early nutrition can result in INTUSN<sup>2,3,15,20</sup>. The distribution of cases of INTUSN was done in various parts of the globe<sup>15</sup>, but no seasonal predilection was noted except in a study [25]. The majority of admissions were in the months of April to July (54%) in our study.

A meta analysis done by a group of researchers Yee X et al<sup>21</sup> analysed the various symptoms of these babies on admission and it was same as in our study. The presenting complaints in our study were abdominal pain (96.82%), incessant crying and irritability (93.65%). Vomiting was seen more in a study<sup>22</sup> and abdominal pain predominant 78.08% in another study<sup>16</sup>.

There are many conditions causing INTUSN in adults and in children as mentioned in the subheading "Introduction". So a thorough knowledge of the various differential diagnosis is important in the diagnosis of any child with blood in stools and its appropriate treatment. Literature review shows that the pediatric INTUSN accounts for only 10 % cases with a definite cause and is usually idiopathic<sup>24</sup>. Some authors found a seasonal variation of the INTUSN that co existed with acute viral gastro enteritis resulting in hypertrophy of Payers patches<sup>25</sup>. A syndrome called Waugh syndrome was noted in literature search cases with malrotation as a result of prolapse of the ileo colic region into the ascending colon. This condition is very important as there is non reduction methods of management of INTUSN<sup>26</sup>.

USG is the main modality to diagnose INTUSN. If we note the history of INTUSN it was in 1674 first mentioned by Barbette of Amsterdam. But the advent of USG in 1977 revolutionised its diagnosis. There are many signs seen in USG of the INTUSN as mentioned in the subheading "Introduction". USG has a high sensitivity of 98% to 100% in diagnosing the commonest type namely the ileo colic INTUSN. The diagnosis of small bowel INTUSN by USG is challenging even for an experienced radiologist. Apart from the mentioned signs a multi-layered "onion skin" round mass on a transverse scan is described. In children any modality of treatment of INTUSN depends on the type of INTUSN. Ileocolic INTUSN requires hydrostatic reduction by USG. Fluoroscopic reduction is not utilised now as USG has advantage over it as there is no radiation. A small bowel INTUSN will have spontaneous reduction. But if persistent and long segment INTUSN will require surgical intervention. In contrast to ileocolic INTUSN, in small bowel INTUSNs there is a lead point<sup>23</sup> and is invariably associated with pathological lead points. Selcan Et al presented a case of idiopathic ileoileal INTUSN in a 4 year old child without a lead point in a 4-year-old child<sup>27</sup>. Literature review mentions that in 2% to 12% children lead points are there and as age advances it is seen to increase and ultimately a surgery is required<sup>28,29</sup>.

#### **V. Conclusion:**

An intervention including early detection, thorough clinical observation and judicious management of INTUSN and its possible complications as per recent guidelines would surely reduce the mortality and morbidity among these babies and children admitted with INTUSN. One should know the excellent prognosis if



acting fast with hydrostatic reduction ,but if child presents with long segment prolapse with ischemia and necrosis ,the mortality increases requiring definitely surgical intervention. So a thorough knowledge of all the aspects of INTUSN is pertinent in its management.

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