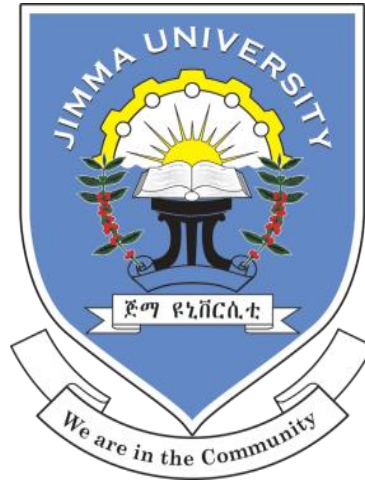


A RETROSPECTIVE ANALYSIS OF PREVALENCE AND OUTCOME OF
INTUSSUSCEPTION IN PEDIATRICS UNDER FIVE YEARS AT JUMC,
SOUTHWEST ETHIOPIA



RESEARCH PAPER FOR THE PREPARATION OF A SENIOR THESIS TO BE
SUBMITTED TO JIMMA UNIVERSITY, COLLEGE OF MEDICAL AND
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IN GENERAL SURGERY

BY: FEKADU NEGASH (MD)

NOVEMBER, 2017

JIMMA, ETHIOPIA

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ABSTRACT

Background: Intussusception (IS) is one of the most frequent causes of abdominal surgical emergencies in young children. It occurs when one segment of bowel invaginates into the distal bowel, resulting in venous congestion and bowel wall edema progressing to bowel necrosis and gangrene if not treated. The causes of IS are idiopathic in most cases. The purpose of this study is to review the prevalence of acute intussusception in under five years in JUMC and to analyze the mode and outcomes of treatment

Methods: This is a **four-year** retrospective study of children aged under five years who were admitted and treated for intussusception between January 2013 to January 2016 GC at JUMC, southwest, Ethiopia. Information on the patients' demographic characteristics, clinical presentation, and month of occurrence as well as the operative findings and outcome were obtained from patient charts and the operating theatre registry. Data was collected using checklist developed for this purpose and entered and analyzed by SPSS version 23.0 software

Results: One hundred and nineteen cases of intussusception were admitted to JUMC over a four year period (January 2013 to January 2016 GC), of which 106 charts were retrieved and analyzed. Males dominated in the series. Age distribution showed that 63.2% were infants (≤ 1 years) and 83% of the cases were children ≤ 2 years of age. Abdominal pain (100%), vomiting (83.9%), bloody mucoid diarrhea (63.2%) and a mass palpated abdominally and/or rectally (12.3%) were the most common modes of presentations, with the classic triad of abdominal pain, vomiting and bloody mucoid diarrhea occurring in almost half of the cases (56.6%). The highest peak of presentation was in the months of February to April with 40(37.7%) cases and in the months of July to August with 22(20.7%) cases. Most patients presented to our hospital after 24 hours of onset of illness and most of them were from around Jimma town. Intraoperative, it was found that ileocolic intussusception was the most common type and 103 patients (97.2%) had no pathologic lead point (idiopathic) while only 3 cases (2.8%) had pathologic lead point. 68(64.2%) patients had successful simple reduction. Post-operative complications occurred in 33(31.1 %) patients the most common of which was surgical site infection 14(13.2 %) and there were 10 deaths.

Conclusion: Intussusception was more common in infants and majority of them presented during the dry and wet season of the year. There was delayed presentation especially for those coming outside of Jimma town with proportional increase in rate of operative management and bowel resection and complications.

Acknowledgement

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Acronyms & Abbreviations

AGE= acute gastro-enteritis
BSC = Bachelor of Science
CI = confidence Interval
CT = Computed Tomography
MRI = Magnetic Resonance Imaging
GP = General Practitioner
IS = Intussusception
SSI= Surgical Site Infection
JUMC = Jimma University Medical Center
ESCH =Ethio-Swedish children's Hospital
UK = United Kingdom
OB/GYN = obstetrics/ Gynecology
OPD = Out Patient Department
OR = Operation Room
TAH = Tikur Anbessa Hospital
URTI=upper respiratory tract infection

Chapter one: Introduction

1.1. Background:

Intussusception is the leading cause of intestinal obstruction in the young child. It refers to the condition whereby a segment of intestine becomes drawn into the lumen of the more proximal bowel. The process usually begins in the region of the terminal ileum, and extends distally into the ascending, transverse, or descending colon. The cause of intussusception is not clear, although current thinking suggests that hypertrophy of the Peyer's patches in the terminal ileum from an antecedent viral infection acts as the starting point. Peristaltic action of the intestine then causes the bowel distal to this point to invaginate into itself (1, 2).

Idiopathic intussusception occurs in children between the ages of approximately 6 and 24 months.{1} Age distribution showed that 69.7% of the cases were < or = 1 year old, and 85% were < or = 2 years old.{3} The overall incidence of IS observed in children aged < 1 year and < 2 years was 28.9 (95% CI: 23.0–34.8) and 26.1 (95% CI: 22.2–30.0) per 100,000 child-year, respectively The number of IS cases were predominantly higher in males than in females (4,6,11)

Since intussusception is frequently preceded by a gastrointestinal viral illness, the onset may not be easily determined. Typically, the infant develops paroxysms of crampy abdominal pain and intermittent vomiting. Between attacks, the infant may act normally, but as symptoms progress, increasing lethargy develops. Bloody mucus ("currant-jelly" stool) may be passed per rectum. Ultimately, if reduction is not accomplished, gangrene of the intussusceptum occurs, and perforation may ensue. On physical examination, an elongated mass is detected in the right upper quadrant or epigastrium, with an absence of bowel in the right lower quadrant (1, 2, 9, 13).

The mass may be seen on plain abdominal x-ray, but is more easily demonstrated on air or contrast enema (1, 2). Abdominal X-ray - may show dilated gas-filled proximal bowel, paucity of gas distally, multiple fluid levels (but may be normal in the early stages).Ultrasound - may show doughnut or target sign, pseudokidney/sandwich appearance. It is a very effective modality and many consider it the investigation of choice. Bowel enema - barium had been gold standard (crescent sign, filling defect) but air and water-soluble double-contrast now available; each has pros and cons - the choice is left to the individual radiologist. CT/MRI scanning - more often used in adults than in children (15, 16, 17, 18)

The management of intussusception has evolved from hydrostatic (barium) reduction through operative intervention to pneumatic reduction in the developed countries, unlike in Africa and other developing countries where operative management is still the mainstay of treatment. This probably may explain why majority of the studies on nonoperative management of intussusception have come from the developed countries, where there are facilities for ultrasound guided hydrostatic (saline) reduction and fluoroscopic guided pneumatic or barium enema reduction. The only report from sub-Saharan Africa on ultrasound guided hydrostatic reduction of intussusception being the report (1, 2, 6). In Ethiopia, to date, the mainstay management for IS remains surgery and the role of hydrostatic reduction for uncomplicated cases is under study in Tikur Anbessa Hospital (4, 13)

1.2 Statement of the problem

Intussusception is one of the most common causes of intestinal obstruction in children. While the outcome has improved in the developed nations, the same cannot be said of the developing countries, more especially in the sub-Saharan region (3, 4)

Despite a high prevalence of acute reported Intussusception in several African countries, very few or no research is done about the prevalence and outcome in the Eastern African country including Ethiopia (4, 13)

Delay in diagnosis of greater than 12 h from initial medical contact was associated with increased morbidity. Associated factors in delayed diagnosis were departure from the classical symptoms (pain, vomiting and blood per rectum) and the presence of diarrhea. GP referral was to the medical team (rather than the surgical team) in around 50% of cases. Irrespective of the specialty of the first hospital doctor to see the patient only 42% were diagnosed correctly within 3 h of admission. In this population diarrhea is a common symptom of intussusception and should alert the clinician rather than reassure. Because of its many presentations and relative rarity, intussusception remains a difficult condition to diagnose (9, 15)

Like many resource-poor settings, acutely ill patients in Ethiopia often present late in the disease process and there is frequently limited time for diagnostic studies and lack of well-trained manpower prior to definitive therapy.

Particular to intussusception, there is a knowledge gap regarding level of late presentation and the effect of late presentation on the prognosis of the diseases in low income setting (9).

1.3. Significance of the study

The result of study will help;

- Surgical teams and other health workers will gain a better understanding on the prevalence and outcome of acute intussusception.
- The outcome of the study will also use as baseline for other researchers.
- Policy makers to gain insight on the role of health education for improvement of early presentation of patients to hospital when they got serious abdominal illness.

Chapter Two –Literature Review

Intussusception is defined as an invagination of the proximal portion of the bowel into an adjacent distal bowel segment. The process usually begins in the region of the terminal ileum, and extends distally into the ascending, transverse, or descending colon. Rarely, an intussusception may prolapse through the rectum. The cause of intussusception is not clear, although current thinking suggests that hypertrophy of the Peyer's patches in the terminal ileum from an antecedent viral infection acts as the starting point. It appears predominantly in males and the most common type is ileocolic invagination (1, 2, 4, 5, 13)

Idiopathic intussusception occurs in children between the ages of approximately 6 and 24 months. Beyond this age group, one should consider the possibility that a pathologic starting point may be present (1, 2)

One hundred and thirty six cases of intussusception were admitted to TAH, Addis Ababa over a four year period, of which 130 charts were retrieved and analyzed. Males dominated in the series. Age distribution showed that 59.2% of the cases were <one year old, and 77.7 % were <two years old. Abdominal pain, vomiting, bloody mucoid diarrhea and a mass palpated abdominally and/or rectally were the most common modes of presentations, with the classic triad of abdominal pain, vomiting and bloody mucoid diarrhea occurring in nearly two third of cases. The highest peak of presentation was in the month of June (wet season) with 18 (13.9%) cases. The mean duration of symptoms before presentation to the hospital was 5.2 days with a range of 1-21 days. Intraoperatively, it was found that ileocolic intussusception was the most common type. Simple reduction without bowel resection was possible in 70.8% of cases. There were 44(33.9 %) complications, wound site infection being the most common occurring in 20 (15.4 %) cases and there were 6 deaths (13)

Sixty six cases of intussusception were admitted to ESCH, Addis Ababa over a 10 year period. Males dominated in the series. Age distribution showed that 69.7% of the cases were < or = 1 year old, and 85% were < or = 2 years old.

Abdominal pain, vomiting, bloody mucoid diarrhea and mass palpated abdominally and/or rectally were the commonest modes of presentations. Intussusception occurred more often in

well-nourished children, but was rare in severely malnourished ones. An underlying intestinal pathology was found in two cases only. The mortality was high probably because the majority of cases presented late for medical attention (4)

Hawassa University, School of Medicine did a Prospective analysis conducted from September 2004 - August 2005 in Yirgalem. 144 children were admitted during study period and 134 children's data were analyzed and 10 children excluded from study due to parent's refusal for intervention or discharged against medical advice. The study showed emergency cases were predominating 73.13% (98) and elective cases were less common 36 (26.26%). Mortality recorded exclusively in children admitted on emergency basis 10 children (7.46%). Acute abdomen was found the leading causes of death in this study (6 children). Delay in presentation also recorded in these children. The leading causes of admission were found to be intussusceptions 19 (14.1%), age of this children ranges 10 were male and 9 female, 14 of them between age of 6 months. Duration of the illness range 11 days. Intraoperative findings showed 9 of them had gangrenous ileocolic intussusceptions and right hemicolectomy and ileocolon anastomosis was performed, the remaining 8 children had viable bowel needs only reduction, out of these 8 children the diagnoses were stratified as 5 with ileocolic intussusceptions, 2 with ileoileal and one with colocolic intussusceptions. Half of mortality in this study was recorded in this group of children who admitted more than 3 days of the illness, 5 children (14)

A Retrospective study was conducted at pediatric surgical unit of Obafemi Awolowo University Teaching Hospitals, Nigeria; involving 78 patients treated for intussusception between January 1993 and December 2011. The case notes of the patients were retrieved and analyzed. There were 58 males and 20 females (M: F = 2.9-1). The age of most of the patients was between 3 months and 9 months with peak incidence at 6 months. Most patients 46 (58.9%) were seen during the dry season of December to April. Only six patients (7.7%) presented within 24 hours of onset of illness. More than half of the patients presented after 24 hours. Passage of red currant stool, vomiting, abdominal pain, fever, and abdominal distension, passage of watery stool, anal protrusion and palpable abdominal mass in various combinations were the clinical features.

All the patients had surgical operations. The most common type of intussusception was ileo-colic type in 64 patients (82.1%). Intestinal resection rate was 41%. The overall mortality rate was 15.4 % (10)

A prospective study on the management of 55 children with intussusception was conducted at the University College Hospital, Ibadan, Nigeria between January 2005 and December 2011. The median age was 7 months. Moreover, the duration of symptoms varied from 1 to 21 days with a mean of 4 days. Twenty-two patients (40%) had attempted hydrostatic reduction; this was successful in 14 patients (63.6%), whereas 8 patients (36.4%) had failed reduction. In all, 41 patients (74.6%) had operative management of intussusceptions; primary operative intervention was carried out in 33 patients (60%) and secondary surgical management in 8 patients (14.5%) with failed hydrostatic reduction. At surgery, manual reduction of intussusception was carried out on 17 patients (30.9%) and resection of devitalized bowel with end to end anastomosis was carried out on the remaining 24 patients (43.6%). The incidence of surgical intervention for intussusception was 74.6%, mortality was 3.6%, and recurrence rate was 3.6% (6)

Three hundred and thirty five patients with acute abdomen were retrospectively analyzed in Changhua Christian Hospital, Taiwan from 2005-2007 GC. 95 pediatric patients were diagnosed with intussusception, including 91 cases with ileo-colic type, three with ileo-ileo-colic type and one with ileo-cecal-colic type. Surgical reductions were performed in 21 cases of ileo-colic type intussusception and in all cases of ileo-ileocolic and ileo-cecal-colic type intussusception. Analysis of the monthly distribution of cases revealed that the peak of intussusception occurred in February. In this study, only 26.3% of patients with intussusception required surgery. In addition, 21 cases with ileocolic type intussusception (23.1%), three ileo ileocolic type (100%), and one ileo-cecal-colic type underwent surgery (100%). Based on this analysis, they found that surgical reductions were needed in all cases of ileo-ileo-colic and ileo-cecal-colic type intussusceptions, compared to 23.1% (21/91) of cases of ileo-colic type intussusception. In this study, they found that cases of intussusception requiring surgery peaked in February, but no obvious seasonal difference (3)

A retrospective study of 110 patients with intussusception presenting to a paediatric accident and emergency department of Royal Hospital, UK; were reviewed over 10 years. The mean age of patients was 13 months with a range of 1 month to 11 years. Eighty per cent of cases occurred in the first year of life. The mean age was 5 months. There were 72 males and 37 females giving a sex ratio of 2:1 male to female. There was a seasonal variation, most cases (16) occurring in

September. An average of 10 cases occurred annually, 80% of which were in the first year of life. As might be expected there was a higher rate of early diagnosis in those children with the most classical symptoms. The presence of diarrhea as an initial symptom delayed diagnosis irrespective of other symptoms or signs that were present. Although the difference was small, a patient was more likely to receive appropriate management within 3 h of admission if seen by a surgical member of staff. Accurate diagnosis was associated with least delay and this was the only group who had a better outcome from air/barium enema with 90% success rates. This group had the highest number with three or more classical signs. Radiographs were taken before diagnosis in a number of cases. In most cases these were subsequently reported as abnormal but not necessarily diagnostic of intussusception. It was clear that an ultrasound scan performed on all abnormal radiographs would have resulted in an earlier diagnosis in 13 cases (9)

A prospective hospital-based multi-center surveillance was conducted in seven hospitals between May 2002 and June 2010 in Singapore. A total of 167 children were enrolled and included in the analyses. The overall incidence of IS observed in children aged < 1 year and < 2 years was 28.9 (95% CI: 23.0–34.8) and 26.1 (95% CI: 22.2–30.0) per 100,000 child-year, respectively. The highest number of IS cases (20/167 [12.0%]) were reported in the age group of six months. The number of IS cases during the entire study period did not show any clear seasonal pattern. The number of IS cases were predominantly higher in males than in females. The majority of children (166/167 [99.4%]) underwent abdominal ultrasound; abdominal radiograph was performed on 96/167 (57.5%) children and gas/ liquid contrast enema was performed on 95/167 (56.9%) children. Furthermore, 33/167 (19.8%) children underwent surgery and bowel resection was performed in 18/167 (10.8%) children. Of the 167 children hospitalized with definite IS, 164 (98.2%) recovered completely, while two children (1.2%) who underwent surgery recovered with sequelae and one child died of septic shock. One child who recovered with sequelae had a successful reduction of IS by surgery but developed *E. coli* septicemia and acute tubular necrosis which required dialysis. One child developed pneumoperitoneum following air enema. This child underwent laparotomy and hemicolectomy was carried out because of serosal split. However, this child recovered fully. The child who died during the study period had undergone air reduction and had recovered from IS. Despite having fully recovered from the IS episode, the child died a month later. Autopsy revealed necrotising enterocolitis, severe hyaline membrane disease, severe generalized lymphocytic depletion and haemosidrosis of the liver and spleen (11)

Chapter Three: Objectives

3.1 General objectives

To assess prevalence of acute intussusception and its surgical outcome in pediatric patient aged under 5 years in JUMC, southwest Ethiopia.

3.2. Specific objectives

- To determine prevalence of acute intussusception among pediatrics presenting with acute abdomen aged under 5 years operated in JUMC.
- To determine the treatment outcome.
- To identify complication among cases of operated acute intussusception in JUMC.
- To determine seasonal variation in occurrence of acute intussusception in under 5 years old.

3.3 conceptual framework

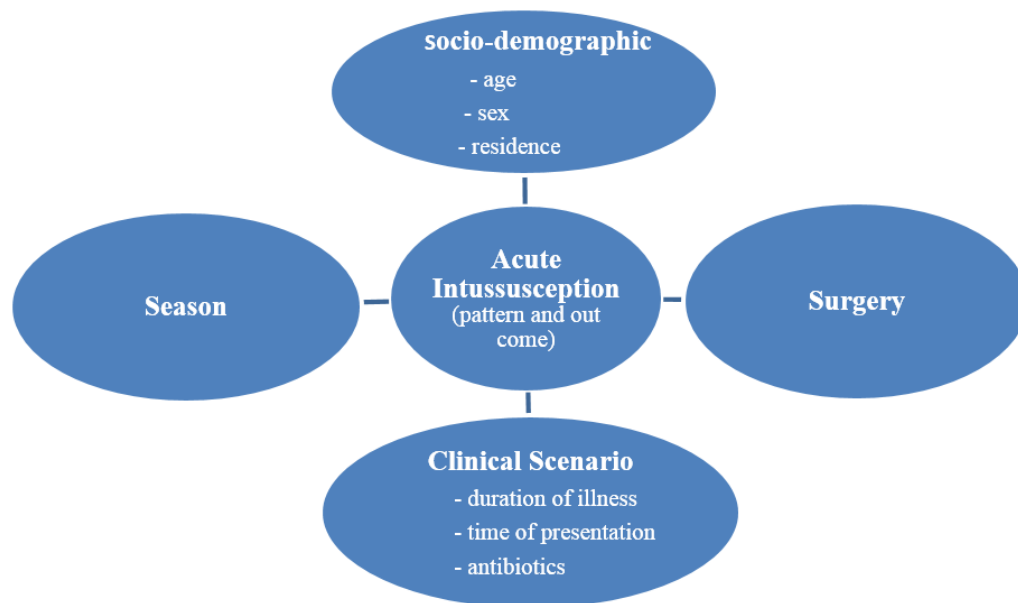


Fig 1: conceptual frame work according to WHO 2002

Chapter four: Methods and Materials

4.1 Study Area and period

The data is collected from patients' charts and records which were admitted with the diagnosis of acute abdomen from January 2013 - January 2016 GC to JUMC.

Jimma zone comprises Jimma town and its nearby woredas. It is located in South West of Ethiopia, Oromia regional state, with estimated population of 2,486,155. The town is located 350 Kilometers from the capital, Addis Ababa.

Jimma University is one of the largest Universities in the countries which runs both undergraduate and graduate programmes in several disciplines.

Jimma University Medical center (JUMC) is one of the medical teaching hospitals in the country. The hospital gives health service at inpatient and outpatient level as a referral Hospital for about 15 million population in the South West of the country.

The hospital has Surgery, Medical, Pediatrics, OB/GYN, Radiology, Ophthalmology, Anesthesiology, Psychiatry, Dental and other health science departments.

The department of surgery has emergency OPD with 22 beds, one Cold surgical OPD and four surgical wards for inpatient treatment (emergency surgical ward, elective surgical ward, pediatric surgery ward and Orthopedics ward) with total 120 beds and about 15,000 annual admission (includes both Emergency and Elective admission).

The department has Referral clinic which gives an outpatient service for General Surgical patients twice a week and for orthopedic surgical patients once a week.

Also the Department owns Minor OR with 2 tables for minor surgery and Major OR with 4 tables which give service for both Elective and Emergency major Operation.

4.2 Study design

A retrospective, hospital-based study was conducted from January 2013- January 2016 GC

4.3 Population

4.3.1 Source population

All pediatrics patients aged under 5 years presented with acute abdomen to JUMC were the source population

4.3.2 Study population

All pediatrics patients presented with acute intussusception to JUMC during the study period of January 2013- January 2016 GC

4.4 Inclusion and exclusion criteria

4.4.1 Inclusion criteria

All pediatrics patients aged under 5 years presented with acute abdomen during the study period were included.

4.4.2 Exclusion criteria

Incomplete data record on the patients cards

4.5. Sample size and Sampling technique

All pediatrics patients aged under 5 years presented with acute intussusception during the study period were included.

4.6. Study variables

Dependent variable

Acute intussusceptions

Independent variables

Age, sex, residence, duration of illness, presentation time (late or early), perioperative treatment, underlying medical illness.

4.7. Operational definition

Duration of illness- time interval between the onset of symptoms of the disease and operative intervention

Late presentation- cases of patients who came to the hospital after 24 hours of onset of illness.

4.8 Data collection procedure and tool

4.8.1 Data collection

First, the operation theatre and admission records were reviewed to develop lists of cases presenting with acute abdomen during the study period. Then, using the patient's card number on the operation or admission record, patient's card was retrieved from the hospital's cards archive. Finally, data was collected (extracted) from patient's card, operation record and admission record using checklist developed for this purpose.

4.8.2 Data collectors

Data collection was undertaken by one 1st year surgical resident, one medical intern, one BSC nurse and two chart record officers after they are trained for one day about clinical presentation, complication and outcome of acute intussusception, objective of the study, variables on the questionnaire and its implication. Then, they were assigned to fill the data collection check list. All data collection activities were supervised by trained surgical residents and primary investigator.

4.9. Data quality control

Adequate training was provided for data collectors, and the compilation format was prepared in simple English to maintain clarity and easier understanding by those data collectors. Data was checked for completeness and some representative cards were cross-checked by supervisor or principal investigator for appropriateness.

4.10. Data processing and analysis

The collected data was checked, edited, coded and entered into SPSS version 23.0 software to be analyzed. SPSS data was checked for error and missing value. Descriptive statistics like measure of proportion was computed. Finally the Results were presented in written form, tabulation & figurative presentations from which conclusion and recommendation was made. Results were compared with other studies & discussed.

4.11 Dissemination plan

After research completion and finalizing the report, the finding of the study will be disseminated to all relevant stakeholders through Presentation and publication. Copies of the research will be submitted to Jimma University, JUMC, from which data will be collected, the ministry of health and other concerned institutions and stake holders for possible applications of the study. The extract of the result will be presented on annual research conferences and published on scientific journals and research proceeding.

4.12 Ethical consideration

The research proposal was submitted to Jimma University Ethical Review Board to obtain ethical clearance, and then data collection was initiated after a letter of permission was obtained from the above responsible office to the head of operation room and Record office. The information gathered about the patient was kept confidential.

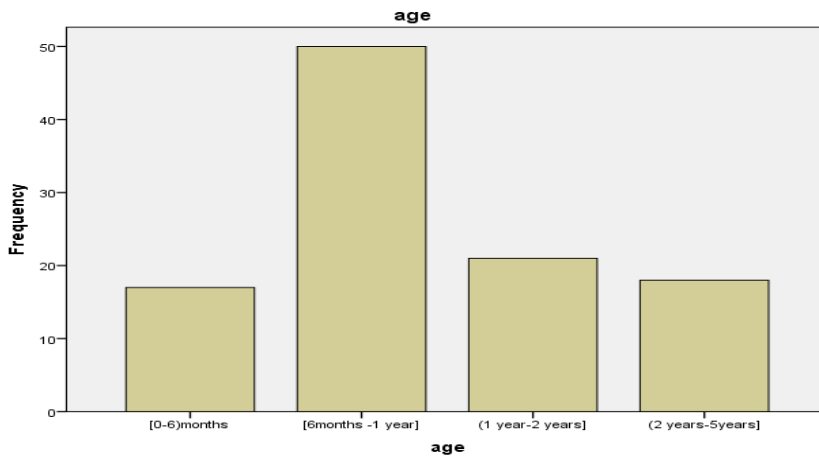
Chapter five: Results

One hundred and nineteen cases of children aged under five were diagnosed with intussusception and admitted to JUMC over a four year period of which 106 charts were retrieved and analyzed. The males were 75 (70.8%), and 31 (29.2%) were females in a ratio of 2.4:1

Table 1: Gender distribution of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC

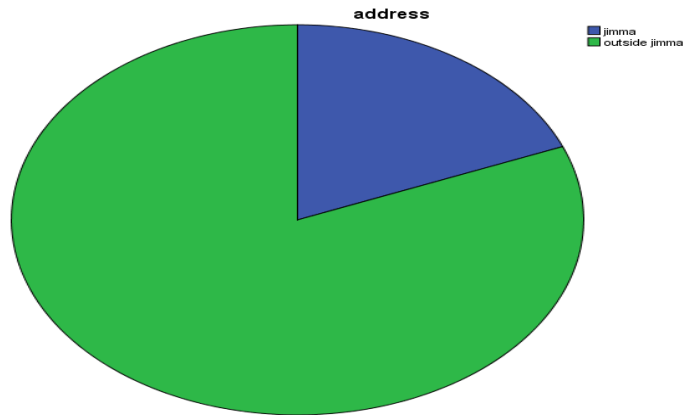
	Frequency	Percent
Male	75	70.8
Female	31	29.2
Total	106	100.0

Age distribution showed that 16% of the case were <6 months, 47.2% were 6 months - one year old, 19.8 % were between one year and two years old and 17% were between 2 and 5 years old. This shows that 63.2% were infants (<=1years) and 83% of the cases were children <= 2years of age. The predominant age group among the infancy is from 6 to 9 months, accounting for 39.8% of those between 6 months to 1 year age group.



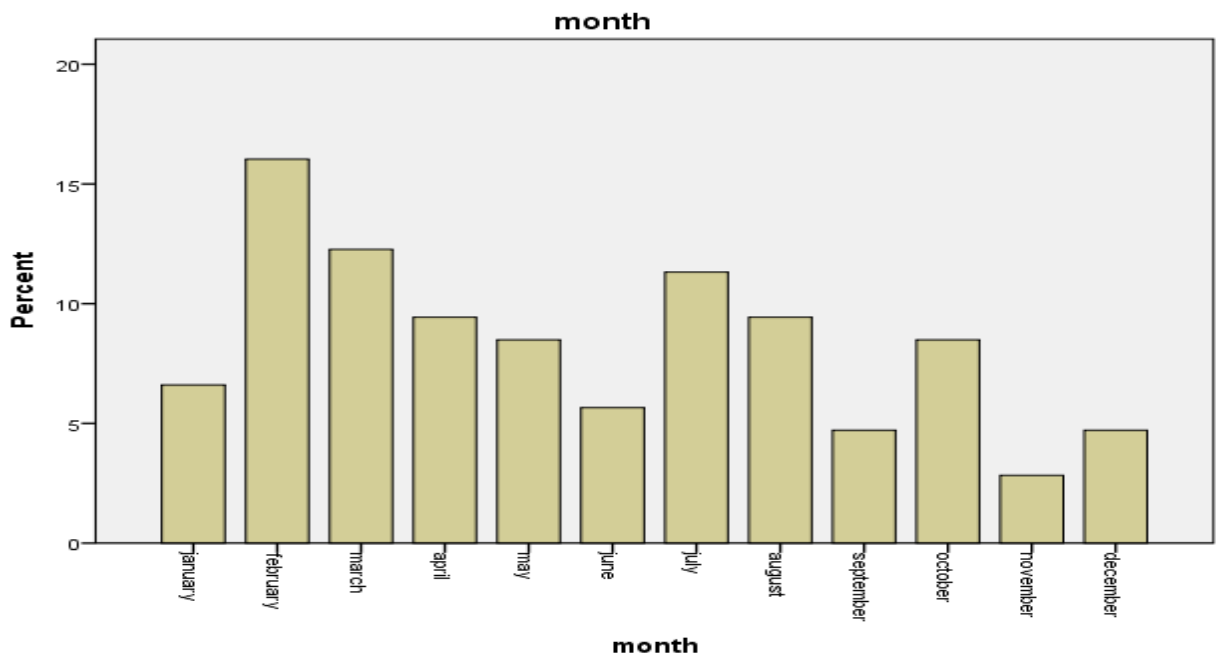
Bar chart 1: Age distribution of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC

Most of the cases seen were from outside Jimma town (mostly from neighboring small towns), accounting for about 81.1 % (86 cases).



Pie chart 1: Residence distribution of children under five years admitted with the diagnosis of ‘IS’ to JUMC from January 2013 – January 2016 GC

The highest peak of presentation was in the months of February to April with 40(37.7%) cases and in the months of July to August with 22(20.7%) cases.



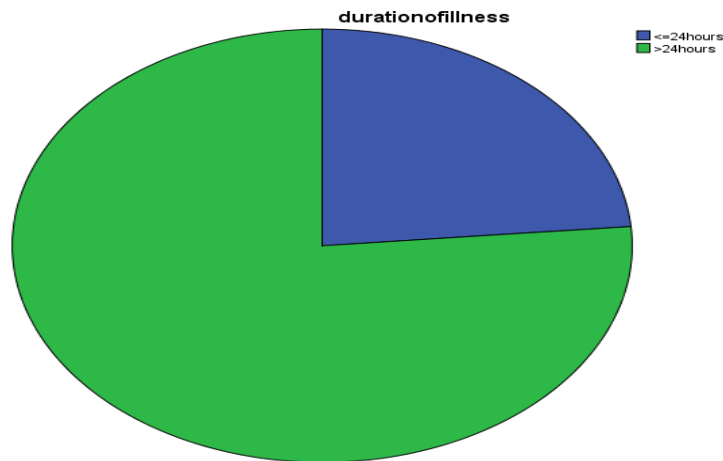
Bar chart 2: seasonal variation of intussusception in children under five years admitted with the diagnosis of ‘IS’ to JUMC from January 2013 – January 2016 GC

There is no identified underlying medical illness in children presenting with intussusception and most of them didn't have sign of malnutrition.

Table 2: Previous history of medical illness of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC

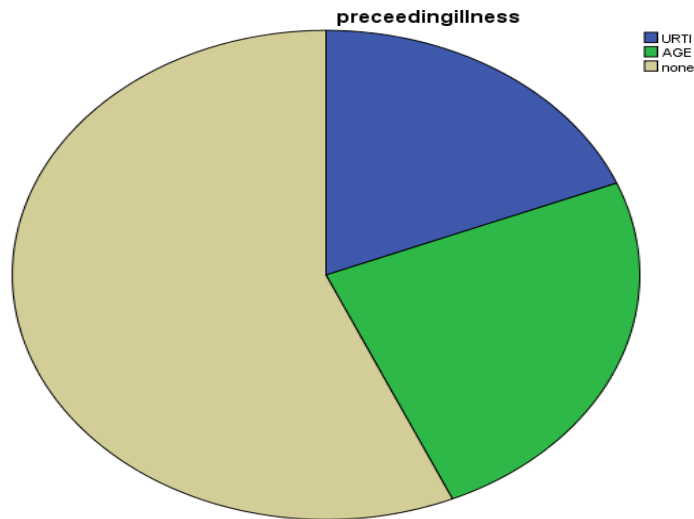
	Frequency	Percent
Yes	1	0.9
No	105	99.1
Total	106	100.0

Most (76.4%) of the patients were present to our hospital after >24hrs onset of illness. Almost all children didn't have underlying medical illness.



Pie chart 2: Duration of illness of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC.

Majority of children diagnosed with intussusception doesn't have preceding illness. Only 18.9% (20 cases) and 24.5% (26 cases) had URTI and AGE within 1- 2 weeks of the diagnosis of intussusception, respectively.



Pie chart 3: preceding illness in children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 G

Abdominal pain (100%), vomiting (83.9%), bloody mucoid diarrhea (63.2%) and a mass palpated abdominally and/or rectally (12.3%) were the most common modes of presentations, with the classic triad of abdominal pain, vomiting and bloody mucoid diarrhea occurring in almost half of the cases (56.6%).

Table 3: Clinical presentation of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 G

		Frequency	Percent
Clinical presentation	Abdominal pain	106	100.0
	Vomiting	96	90.6
	Bloody diarrhea	73	68.9
	Mass per rectum	11	10.4
	Triad (pain, vomiting, diarrhea)	60	56.6

Almost two third of the patient present with dehydrated vital sign.

*Table 4:*preoperative vital sign of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC

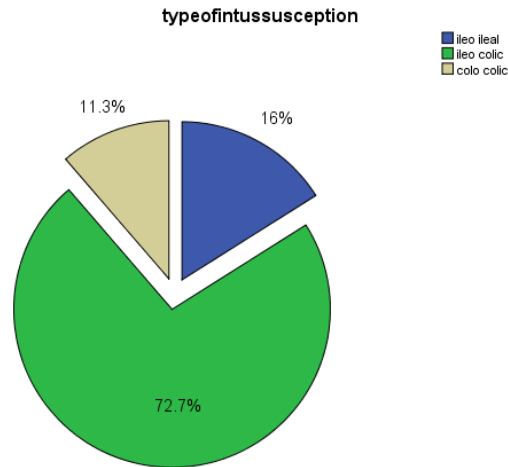
	Frequency	Percent
Stable	22	20.8
Dehydrated	73	68.9
Shocked	11	10.4
Total	106	100.0

Half of 50%of the children operated for the diagnosis of intussusception didn't receive preoperative antibiotics or prophylactic antibiotics.

*Table 5:*preoperative antibiotics of children under five years admitted with the diagnosis of 'IS' to JUMC from January 2013 – January 2016 GC

	Frequency	Percent
Yes	53	50.0
No	53	50.0
Total	106	100.0

Intraoperatively, it was found that ileocolic intussusception was the most common type. Majority of the intussusceptions, 103 patients (97.2%) were of idiopathic origin while only 3 cases (2.8%) had pathologic lead point



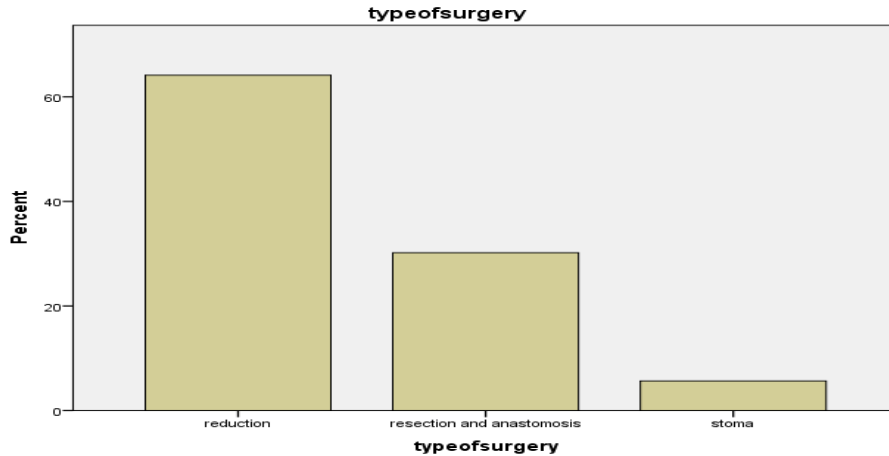
Pie chart 4: Type of intussusception in children under five years operated for the diagnosis of intussusception in JUMC from January 2013 – January 2016 GC

Intra-operatively, 64.2 % (68 cases) were viable and 28.3% (30 cases) were found to be gangrenous.

Table 6: Intraoperative finding in children under five years operated for the diagnosis of 'IS' in JUMC from January 2013 – January 2016 GC

	Frequency	Percent
Viable	68	64.2
Ischeamic	8	7.5
Gangrenous	30	28.3
Total	106	100.0

68(64.2%) patients had successful simple reduction. The remaining 32(30.2%) patients who had bowel gangrene and or inability to reduce the apex of the intussuscepted due to pathologic lead point or edema of bowel wall had intestinal resection.



Bar chart 3: Type of surgery in children under five years operated with the diagnosis of 'IS' in JUMC from January 2013 – January 2016 GC.

Most of the children 103 (97.2%) received post-operative antibiotic

Table 7: Post-operative antibiotics for children under five years operated for the diagnosis of 'IS' in JUMC from January 2013 – January 2016 GC

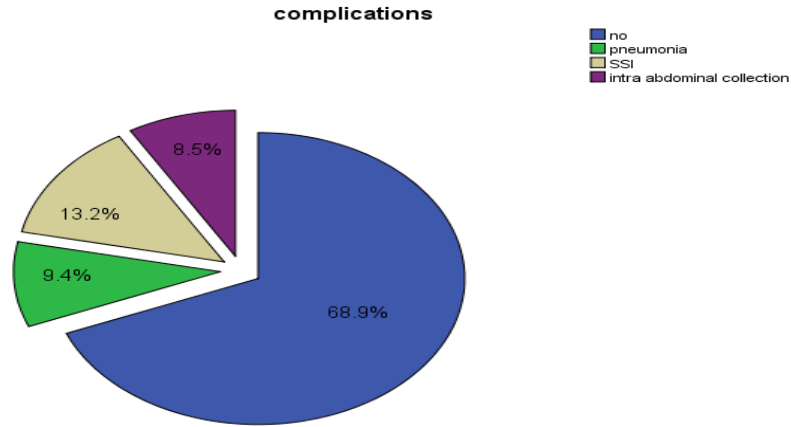
	Frequency	Percent
Given	103	97.2
not given	3	2.8
Total	106	100.0

Half of the patients who underwent surgery stayed in the hospital.

Table 8: Duration of hospital stay of children under five years operated for the diagnosis of 'IS' in JUMC from January 2013 – January 2016 GC

	Frequency	Percent
<= 7 days	53	50.0
> 7 days	53	50.0
Total	106	100.0

Post-operative complications occurred in 33 patients (31.1 %) the most common of which was surgical site infection (13.2 %). Seven patients were re-operated for drainage of intra-peritoneal collections.



Pie chart 5: post-operative Complications of children under five years operated for the diagnosis of ‘IS’ in JUMC from January 2013 – January 2016 GC

There were a total of 10(9.4%) deaths

Table 9: Outcome of children under five years operated for the diagnosis of ‘IS’ in JUMC from January 2013 – January 2016 GC

	Frequency	Percent
discharged improved	96	90.6
Died	10	9.4
Total	106	100.0

Duration of illness has a direct relationship with the post-operative complication and outcome with a significant association (p-value 0.002)

Table 10 :Cross tabulation; duration of duration of illness, post-operative complications and outcome

	Complications				Outcome		Total	p-value
	no	pneumonia	SSI	intra-abdominal collection	Improved	died		
Duration of illness ≤24 hours	25	0	0	0	25	0	25	0.002
>24 hours	48	10	14	9	71	10	81	
Total	73	10	14	9	96	10	106	

Chapter six: Discussion

The male preponderance in this report is similar to findings in other parts of the world.^{[4],[6],[11]} Majority of the children presented during infancy and a peak age group incidence of 6-9 months. Most literature reports agree with this findings.^{[4],[6],[11]}

Researches done in other centers indicated that intussusception has a seasonal pattern.^{[6],[10],[13]}

We observed in this series a higher number of intussusception during the dry season followed by the wet season. The high incidence of this condition during the dry and wet seasons, in this study, may relate to the hyperplasia of the Peyer's patches caused by a viral infection of the respiratory tract and gastro-intestinal tract, which is more prevalent during these periods.^{[1],[2]}

The classical clinical features of abdominal pain, vomiting, passage of bloody mucoid stool, and palpable abdominal mass are the most predominant findings in our study, and this concur with reports from available literatures.^{[4],[9],[13]}

Most of the patients in this study presented late to the hospital, as in the previous report and studies, with poor clinical condition that usually require prolonged resuscitation.^{[9],[13],[15]} In this study, 81(76.4%) patients presented after 24 hours. Most of these patients came from outside Jimma town (81.1%). The delay in presentation could be attributed to poverty, ignorance, wrong diagnosis and delayed referral. The medical officers in most peripheral centers often manage most children with intussusception for dysentery, gastro-enteritis, and sometimes rectal prolapse before referral.^{[9],[15]}

Most of patients presented to emergency OPD with deranged vital signs. The diagnosis was made clinically and confirmed at laparotomy, but sometimes supplemented by abdominal ultrasound and plain abdominal X-ray.

Despite the diagnosis of intussusception and late presentation, only 50% of the patients received pre-operative antibiotics. But majority of the patients were receiving post-operative antibiotics except three (2.8%) cases.

In this study, all our patients had exploratory laparotomy. Ileo-colic intussusception was the most common variety observed. This agrees with the general pattern.^{[10],[11],[13]} Most of the intussusception was idiopathic in origin with just 3 patients having pathologic lead points.

The spectrum of post-operative complications observed is similar to other reports^{[4],[11],[13]}. They followed intestinal gangrene and consequent bowel resection caused by delayed presentation.

Thirty two patients (30.2%) had intestinal resection with primary anastomosis. This figure is comparable with the data from the Nigeria.^{[6],[10]} The high rate of bowel resection in our study is as a result of inability to reduce apex of edematous intussusceptum and bowel gangrene.

Data extracted from available literature from developed countries reported significantly lower post-operative mortality rate.^{[3],[4]} This cannot be said of in our sub-Saharan region, particularly Ethiopia.^{[10],[13],[15]}

In this study, 50% of the patients stayed in the hospital for more than seven days after undergoing surgery. We recorded a mortality rate of 10(9.4%); a bit higher than that TAH report of 6 cases^[13]

We attribute the delayed hospital stay and the high mortality in this series to late presentation and the metabolic stress of open surgery on these sick children who have poor physiologic reserve.

Chapter seven: Conclusions and Recommendations

The findings attained in our research were comparable to those in the region except the bimodal seasonal variation seen in our study (both dry and wet season).

Most of our patients present late to us which has significantly affected patients' outcome ($p=0.002$). A high index of suspicion among health care givers is necessary to make early diagnosis in pediatric age group presenting with the quartet of abdominal pain, vomiting, passage of bloody mucoid stool and palpable abdominal/rectal mass. Early referral to specialized centers where adequate equipment is available to handle these children would reduce the mortality rate.

Even though it is difficult to deduce the role of preoperative antibiotics from this research, it is better that the patients get them before operation.

Recommendations;

There should be a paradigm shift from open surgery to barium or air contrast reduction among children presenting early enough to the hospital, which is expected to reduce the metabolic stress of open surgery on these sick children who have poor physiologic reserve.

Health worker mentorship should be instituted to facilitate early referral to specialized health centers like JUMC.

Limitations of the research

It is a retrospective analysis which makes our data less reliable because of poor recording of the information about the overall conditions of the patients.

There were lost cards which makes certain deduction difficult.

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Annex: Data collection check lists

1.	Card NO.	
2.	Age	(in years)
3.	Sex	1. Male 2. Female
4.	Address	1. Jimma 2. Outside Jimma
5.	Underlining medical illness	1. DM 3. malnutrition 2. HIV/AIDS 4. Other
6.	Pervious history of abdominal surgery	1. Yes 2. No
7.	Duration of illness	1.</=24 hrs 2. > 24 hrs
8.	Preceding illness	1. URTI 3.other 2. AGE
9.	Pre-operative V/S	1.Stable 3.shocked 2. Dehydrated 4. other
10.	Clinical presentation	1.Abdominal pain 2.vomiting 3.bloody mucoid diarrhea 4.mass per rectal
11	Pre-operative diagnosis	
12	Mode of Diagnosis	1. Clinical 3. Intraoperative 2. Imaging 4. other
13	Pre-operative treatment with antibiotics	1.yes 2.no
14	Prophylactic antibiotics	1.given 2.not given

15	Type of IS	1. ileo-ileal 3. colo-colic 2. Ileo-colic 4. other
16	Intra-operative finding	1. Viable 3. gangrenous 2. ischemic 4. other
17	Type of surgery	1. simple reduction 2. resection and anastomosis 3. stoma 4. other
18	Post-operative antibiotics	1.given 2.not given
19	Duration of Hospital stay	1. \leq 7 days 2. $>$ 7 days
20	Complication	1.no 2. yes
21	If yes to Question No.14	1.pneumonia 2.atelectasis 3.SSI 4.intra-abdominal collection 5.other
22	Outcome	1. Discharged improved 2. Died