ORIGNAL ARTICLE

DETERMINANTS OF BOWEL RESECTION IN CHILDHOOD INTUSSUSCEPTION

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Background: Intussusception is an acute surgical emergency and one of the most common causes of acute abdomen in early paediatric age group with peak incidence between 3 months to 3 years. It is considered the most common cause of intestinal obstruction in first two years of life. Early diagnosis and management may prevent major complications of bowel ischemia and necrosis thus avoiding morbidity and mortality. Our objective was to evaluate the risk factors or determinants of bowel resection in childhood intussusception. **Methods:** It is a prospective, descriptive and cross-sectional study in which 102 consecutive cases of intussusception presenting to The Children's Hospital PIMS, from January 2018 to May 2019, were included. **Results:** Total 102 patients were included in the study. Seventy-three (71.6%) were male and 29 (28.4%) were female. Mean age at presentation was 16.30 months (ranged from 1 day to 9 years). Mean duration of symptoms was 3.1 days. 52.9% (53/102) patients had mass palpable on abdominal examination while 22.5% (23/102) had palpable mass on digital rectal examination (DRE). Mean haemoglobin at presentation was 10.2 g/dL (min 4g/dL, max 26g/dL) and mean haematocrit was 32.6%. The most common type of intussusception was ileo-colic (57.8%) followed by ileo-ileal (21.6%). 36.3% (37/102) patients had to undergo bowel resection due to bowel gangrene/necrosis while in 66 (64.7%) patients had manual reduction. Statistically significant relationship was found between resection and duration of symptoms more than 24 hours (p=0.01, CI=95% OR= 6.24), haemoglobin less than 10g/dL (p=0.022, CI=95% OR=2.78) and haematocrit less than 30% (p=0.028, CI=95% OR=2.63). **Conclusion:** Prevention of anaemia and early presentation to a facility where trained paediatric surgeons are available can reduce the chances of bowel resection in childhood intussusception.

Keywords: Intussusception; Paediatric age; Risk factors; Intestinal viability; Intestinal necrosis; Pakistan

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INTRODUCTION

Childhood Intussusception is the most common acquired cause intestinal obstruction occurring in infants and young children between three months to three years with the reported incidence of 20–100/100,000 children per year.[1] It's a surgical emergency and if not dealt in time, can lead to undue morbidity and mortality. Early diagnosis and treatment are necessary as any delay may result into intestinal ischemia, necrosis and perforation resulting in bowel resection and mortality.[2]

In intussusception, a portion of gut invaginates into another portion. Most of the cases with intussusception don't have definitive pathological lead point thus termed as idiopathic/ primary. Some of them has definitive lesion serving as a lead point that draws the proximal gut into distal one with peristaltic activity.[3] In infants, majority of intussusceptions are idiopathic and the frequency of pathological lead points increases with advancing age.[4] Only one third of the patients of intussusception present with classic triad of abdominal pain, vomiting and red currant jelly stool. Intussusception is usually diagnosed clinically and confirmed on radiological investigations.[3]

Surgery is still a mode of treatment in developing countries despite advancements in treatment modality such as non-operative reduction through fluoroscopic guided barium enema and pneumatic reduction which is being practiced in developed countries.[5]

Our study is aimed at finding out the risk factors or determinants of intestinal necrosis that result in bowel resection. Various determinants such as age, gender, duration of symptoms, haemoglobin at presentation, haematocrit, palpable mass of abdomen/ digital rectal examination, presence of

pathological lead point and type of intussusception were looked for their association with bowel resection

MATERIAL AND METHODS

This is a prospective and descriptive study in which patients below 12 years of age operated for intussusception at The Children's Hospital, Pakistan Institute of Medical Sciences (PIMS), Islamabad, Pakistan, from January 2018 to May 2019, were included. The Children's Hospital PIMS is the main referral centre for paediatric surgical patients catering whole of north and North West of Pakistan.

The study population included all the patients below 12 years of age who were admitted in paediatric surgical ward and were operated for intussusception. Patients above 12 years with intussusception were excluded as they were managed and operated in adult surgical ward. Patients were recruited through Accident and Emergency, paediatric medical wards and paediatric surgical wards after resuscitating them by surgical team. Patients meeting the inclusion criteria were enrolled consecutively. Preoperatively, patients were diagnosed on clinical examination followed by radiological investigations which was subsequently confirmed at surgery. Only those patients who had confirmed diagnosis of intussusception at surgery were included in the study. Initial resuscitation was done with making patient Nil per os (NPO), intravenous fluids, placement of nasogastric tube; urethral catheterization, broad spectrum antibiotics and painkillers. Haematological laboratory tests included Total leukocyte count, haemoglobin, platelet count and coagulation profile. Biochemical tests included urea, creatinine, random blood sugar, serum electrolytes, blood grouping and cross-matching. Radiological investigations included ultrasound and X-ray abdomen erect.

After resuscitation, exploratory Laparotomy was performed through right upper transverse incision under general anaesthesia. Surgeries were performed by consultants and senior residents under supervision. Patients were kept NPO postoperatively until bowel sounds return and nasogastric tube removed. Removal of stitches was done between 10^{th} to 14^{th} post-operative days. Follow up was done until discharge or death of the patient. Data obtained included name, age at presentation, sex, duration of symptoms, types of symptoms (abdominal pain, distension, vomiting, per rectal bleed, constipation), haematological investigations (total leukocyte count, haemoglobin, haematocrit, serum electrolytes) radiological investigations (ultrasound and X-ray abdomen) operative findings, type of surgical procedure, post-operative complications and duration of hospital stay. The statistical analysis was performed using statistical SPSS version 21. Descriptive statistics like mean and standard deviation for quantitative data and frequency and percentages for qualitative data were calculated. Chi-square test was applied to associate different parameters with bowel resection. p-value <0.05 was considered significant. Multivariate logistic regression analysis was applied for determination of predictor variables that predict the bowel resection.

A written informed consent was taken from parents/guardians and approval to carry out the study was taken from institutional ethical review board.

RESULTS

Total 102 patients were included in the study. Seventy-three (71.6%) were male and 29 (28.4%) were female. Mean age at presentation was 16.30 months with minimum age of 1 day and maximum age of 108 months (9 years). Mean duration of symptoms was 3.1 days with minimum of 8 hours and maximum of 14 days. Details of individual symptom is given in Table-1. 23.5% (24/102) patients had history of upper respiratory tract infection while 37.3% (38/102) patients had loose motions prior to start of symptoms. 52.9% (53/102) patients had mass palpable on abdominal examination while 22.5% (23/102) had palpable mass on digital rectal examination (DRE). 73.5% (17/102) patients had red currant jelly stool at presentation. Ultrasound was suggestive of intussusception in 90 (88.2%) patients and 12 patients were explored on clinical suspicion. Mean haemoglobin at presentation was 10.2 g/dL (min 4g/dL, max 26g/dL) and mean haematocrit was 32.6 % (min 17.2% and max 57.6%).

The most common type of intussusception was ileo-colic (57.8%) followed by ileo-ileal (21.6%). Details of various types are shown in Figure-1. Pathological lead point (PLP) was present only in 34 (34.7%). Most common type of PLP was appendix followed by lymph node and Meckel's diverticulum (Figure-2). 36.3% (37/102) patients had to undergo bowel resection due to bowel gangrene/necrosis while in 66 (64.7%) patients' manual reduction was possible without resection. Out of 37 who underwent bowel resection, end to end bowel anastomosis was possible in 25 patients and 12 had to undergo some form of stoma due to faecal peritonitis. Most common post-operative complications were burst abdomen (3), sepsis (3), recurrent intussusception (2), anastomotic leak (1) and surgical site infection (1). Mean duration of hospital stay was 4.5 days (ranged from 1 to 25 days).

Mortality was 1.96% (2/102). Various variables as age, gender, duration of symptoms, haemoglobin at presentation, haematocrit, palpable abdominal mass/ digital rectal examination, presence of pathological lead point and type of intussusception were compared for their association with bowel resection. Statistically significant relationship was found between resection and duration of symptoms more than 24 hours (p=0.01, CI=95% OR=6.24), haemoglobin less than 10g/dL (P=0.022, CI=95% OR=2.78) and haematocrit less than 30% (P=0.028, CI= 95% OR=2.63). Thirty-three out of 37 patients having duration of symptoms more than 24 hours had bowel resection. Similarly, out of 37 resections 27 patients had haemoglobin less than 10g/dL. Total 33 patients had haematocrit of less than 30% and 17 had to undergo resection. No significant relationship was found when resection was compared with gender (p=0.18), age (p=0.97), palpable abdominal mass (p=0.32), mass on DRE (p=0.86), presence of pathological lead point (p=0.52) and type of intussusception (p=0.28)

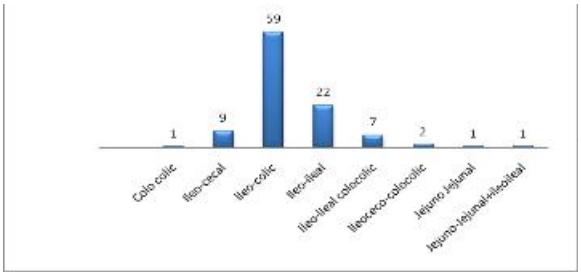

Figure-1: Types of intussusception

Table-1: Details of Individual symptom

Symptom	Frequency	Percentage
Parental history of abdominal pain	86	84.3
Vomiting	87	85.3
Blood in stool	76	84.5
Abdominal distension	53	52

Table-2: Types of PLP in our study

Type of PLP	Frequency
Appendix	14
Burkit's Lymphoma	1
Gut Duplication cyst	1
Lymph node	10
Meckel's diverticulum	8

DISCUSSION

Bowel necrosis is one of the serious complications of intussusception leading to significant morbidity and mortality. Even in developed countries where despite of improvement in diagnosis and treatment, poor outcomes related to bowel necrosis still occur.[6] Loss of intestinal viability can occur in cases of delayed presentation, diagnosis or treatment necessitating bowel resection. There is no predictive index for bowel resection in childhood intussusception in literature so far. There are very few publications in literature documenting risk factors for bowel resection.[1] In our study 36.3% cases required bowel resection and longer duration of symptoms were significantly related to bowel resection. Out of 37 bowel resections, 33 (89.1%) patients had duration of symptoms longer than 24 hours at presentation. These results are comparable to various studies in literature. In a study conducted by Yao *et al*, in which 24.1% paediatric patients with intussusception had loss of intestinal viability and it was significantly associated with history of symptoms longer than 27.5 hours.[7] Wong CWY *et al* found that 38.4% of their study population had bowel resection and longer duration of symptoms was significantly associated risk factor for bowel resection.[1] High rates of bowel resection were shown in paediatric patients presenting after 3 days of presentation in a study conducted by Ogundoyin *et al*.[8] Johnson *et al* investigated risk factors for bowel resection among infants with intussusception. In their study 33% of study population required bowel resection and they found that duration of symptoms more than 2 days in infants with intussusception were the independent risk factors for bowel resection.[9] In another study conducted by Chalya *et al* in a tertiary care hospital Tanzania, 46.4% of study population had to undergo bowel resection and they found that late presentation more than 24 hours of onset of symptoms was significantly associated with bowel resection (p=0.001).[10] Similar risk factor association was reported by Gadisa *et al*[3] Ekenze *et al* conducted a study in which they divided their study population into two groups. Group-1 included patients with intussusception presented within 24 hours and Group 2 had patients who presented after 24 hours. Their results showed that 84.6% patients who presented early, i.e., within 24 hours had successful reduction of intussusception and thus resection was avoided as compared to late presenters in which only 54.1% patients had successful reduction and 45.9% had to undergo resection. They concluded that late presenters have higher chances of bowel resections.[11] A Nigerian study concluded that they had high rate of bowel resection in cases of childhood intussusception because of late presentation.[12]

Anaemia and low haematocrit have not been investigated by any study as risk factors for bowel resection. To the best of our knowledge, it is the ever first study analysing anaemia and low haematocrit as determinants for bowel resection. In our study these two variables had significant association with bowel resection in childhood intussusception. According to our study, children having Haemoglobin less 10g/dL have 2.7 times more chances of bowel resection as compared to patients with haemoglobin more than 10 g/dL. Similarly, patients with haematocrit less than 30% are 2.6 times more at risk of bowel resection than those having haematocrit more than 30%. Further studies with large sample sizes are required to validate the

predictive value of these variables in bowel resection. In our study age was not significantly associated with bowel resection which is comparable to a study conducted by Yao *et al*. in which no significant relationship was found between loss of intestinal viability and age (p=0.702).[7] Similar results were shown in a study conducted by Ezomike *et al*.[13]

Gender as associated risk factor evaluated by our study had no significant relationship with bowel resection. A comparative analysis between manual reduction and bowel resection done by Ezomike *et al* also showed similar results with no gender association of bowel resection in intussusception.[13] However, in a study by Yao *et al*, female gender had higher chances of bowel resection than males (p=0.049). According to them reason for females being at risk of bowel resection in their study may be due to longer duration of symptoms in females as compared to males (p=0.003).[7] Huang *et al* found males to be more at risk of bowel resection as compared to females.[6] Further studies are needed for validation of gender as predictor for bowel resection. Pathological lead point (PLP) was not associated with bowel necrosis/ resection in our study. Similar results were shown by Huang *et al* and Yao *et al*.[6,7] According to Yao *et al*, out of 316 patients only 20 had PLP and only 5 patients (25%) with PLP had bowel resections making insignificant relationship between PLP and bowel resection (p=1.00).[7] Our study lists longer duration of symptoms, anaemia and low haematocrit as determinants of bowel resection in childhood intussusception, based on the results of our statistical analysis. These findings might be helpful for researchers, public health and clinical institutions in devising predictability index for bowel necrosis/ resection in childhood intussusception so that serious complications such as bowel necrosis can be prevented thus reducing undue morbidity.

CONCLUSION

In conclusion, prevention of anaemia and early presentation to a facility where trained paediatric surgeons are available can reduce the chances of bowel resection in childhood intussusception.

Conflicts of interest: None

AUTHORS' CONTRIBUTION

MUN: Conceptualization of article design, write-up of manuscript, data collection and literature search. NAK: Statistical analysis and formulation of results. NJ: Literature search. SS: Editing and Literature search. MAC: Proofreading and final approval. MAAS: Data collection and literature search

REFERENCES

1. Wong CW, Jin S, Chen J, Tam PK, Wong KK. Predictors for bowel resection and the presence of a pathological lead point for operated childhood intussusception: A multi-center study. J Pediatr Surg 2016;51(12):1998–2000.
2. Somme S, To T, Langer JC. Factors determining the need for operative reduction in children with intussusception: a population-based study. J Pediatr Surg 2006;41(5):1014–9.
3. Gadisa A, Tadesse A, Hailemariam B. Patterns and Seasonal Variation of Intussusception in Children: A Retrospective Analysis of Cases Operated in a Tertiary Hospital in Ethiopia. Ethiop Med J 2016;54(1):9–15.
4. Mirza B. Inverted Meckel's Diverticulum Simulating Pedunculated Polyp as a Lead Point for Ileoileal Intussusception in a Child. APSP J Case Rep 2013;4(1):6.
5. Ogundoyin OO, Olulana DI, Lawal TA. Childhood intussusception: A prospective study of management trend in a developing country. Afr J Paediatr Surg 2015;12(4):217–20.
6. Huang HY, Huang XZ, Han YJ, Zhu LB, Huang KY, Lin J, *et al*. Risk factors associated with intestinal necrosis in children with failed non-surgical reduction for intussusception. Pediatr Surg Int 2017;33(5):575–80.
7. Yao XM, Chen ZL, Shen DL, Zhou QS, Huang SS, Cai ZR, *et al*. Risk factors for pediatric intussusception complicated by loss of intestine viability in China from June 2009 to May 2014: a retrospective study. Pediatr Surg Int 2015;31(2):163–6.
8. Ogundoyin OO, Olulana DI, Lawal TA. Childhood intussusception: Impact of delay in presentation in a developing country. Afr J Paediatr Surg 2016;13(4):166–9.
9. Johnson B, Gargiullo P, Murphy TV, Parashar UD, Patel MM. Factors associated with bowel resection among infants with intussusception in the United States. Pediatr Emerg Care 2012;28(6):529–32.
10. Chalya PL, Kayange NM, Chandika AB. Childhood intussusceptions at a tertiary care hospital in northwestern Tanzania: a diagnostic and therapeutic challenge in resource-limited setting. Ital J Pediatr 2014;40(1):28.
11. Ekenze SO, Mgbor SO. Childhood intussusception: the implications of delayed presentation. Afr J Paediatr Surg 2011;8(1):15–8.
12. Ekenze SO, Mgbor SO, Okwesili OR. Routine surgical intervention for childhood intussusception in a developing country. Ann Afr Med 2010;9(1):27–30.
13. Ezomike UO, Ekenze SO, Igwilo IO. Comparative Analysis of Clinical Indices in Manual Reduction and Bowel Resection for Childhood Intussusception. Int J Med Health Dev 2017;22:3–7.

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