



ILEOSTOMY IN NEWBORNS: A COMPREHENSIVE 15-YEAR STUDY INVESTIGATING CAUSES, TIMING, AND NEUROLOGICAL OUTCOMES FOLLOWING BOWEL OBSTRUCTION

Dr. Murchana Khound^{1*}, Dr. Sujit Chowdhary², Dr. Saroja Balan³

¹Assistant Professor in Department of Pediatrics, AIIMS Guwahati,

²Senior Consultant Paediatric Surgery and Paediatric urology in Indraprastha Apollo Hospital Delhi.

³Senior Consultant and Neonatologist, Indraprastha Apollo Hospital Delhi

***Corresponding Author:** Dr. Murchana Khound

*Assistant Professor in Department of Pediatrics, AIIMS Guwahati

Abstract

Background: Advancements in perinatal care have increased the survival rates of low birth weight (LBW) infants, leading to a rise in abdominal operations, notably for conditions like necrotizing enterocolitis (NEC) and spontaneous intestinal perforation (SIP). Ileostomies are common in newborns with surgical abdominal emergencies, yet a research gap exists in understanding causes, timing, and outcomes, especially neurological, following bowel obstruction in this population.

Methods: A 15-year observational study at a tertiary care multispecialty hospital investigated 65 infants undergoing ileostomy. Variables included indications, gestational age, age at ileostomy, weight, closure timing, and outcomes. Exclusions comprised newborns with birth asphyxia, congenital malformations, and identified neurological deficit causes. Ethics clearance was obtained, and statistical analysis involved SPSS version 16.

Results: Total 65 babies underwent ileostomy from July 2006 to July 2021. Males were 48(73.8%) and females were 17(26.2). The most common indication for ileostomy was NEC (55.4%). Mean gestational age was 33weeks(± 4 weeks SD), and mean age at ileostomy was 16 days. Mean weight at Ileostomy was 2.04 Kg(± 0.96 Kg). Outcomes showed 69.2% recovery, 20% mortality, 7.7% left against advice, and 6.1% transferred. Of those recovered, 33.8% experienced post-ileostomy complications which included conjugated hyperbilirubinemia, failure to thrive, prolapse, adhesions, wound dehiscence, etc. One-year neurological follow-up in 38 patients revealed 35 with normal development.

Conclusion: This comprehensive study sheds light on the complex landscape of neonates undergoing ileostomy, emphasizing the prominence of NEC and the impact of gestational age on outcomes. The positive neurological outcomes at one year underscore the need for continued monitoring in this vulnerable population. While promising, the study advocates for extended follow-ups and further exploration of long-term outcomes to refine perinatal management strategies.

Introduction: Advancements in perinatal care have significantly bolstered the survival rates of low birth weight (LBW) infants, resulting in a notable increase in abdominal operations. This surge is primarily attributed to the heightened prevalence of acute abdomen conditions like necrotizing enterocolitis (NEC) and spontaneous intestinal perforation (SIP) in these vulnerable infants¹⁻². The

management approach for acute abdomen cases varies, considering factors such as the underlying cause, disease severity, and overall patient condition. While some cases may be treated conservatively, others may necessitate surgical options like primary closure, primary anastomosis, enterostomy with or without intestinal resection, and peritoneal drainage. Amid ongoing debates on optimal treatment, enterostomy stands out as a generally safe option for LBW patients confronting acute abdomen issues³⁻⁶.

Ileostomies, involving the creation of a surgical opening on the skin's surface by bringing out the end or loop of the small intestine (ileum), are frequently performed on newborns facing surgical abdominal emergencies. This strategy provides bowel rest until physiological recovery occurs⁷. The two major groups requiring ileostomies are preterm infants with NEC⁸ and term infants with various surgical conditions⁷. Despite the procedure being common in sick newborns, often involving substantial gut resection, there is a research gap in understanding the causes, timing, and outcomes of ileostomy procedures in newborns with bowel obstruction especially in Indian literature. Additionally, a dearth of research on neurological outcomes one year post-ileostomy underscores the need for a focused study to enhance our understanding and guide optimal perinatal management strategies for this vulnerable population. The proposed study aims to assess causes, gestational age, weight at ileostomy, closure timing, outcomes, complications, and neurological assessments at one year of age in newborns requiring ileostomy due to post-birth bowel obstruction.

Materials and Methods: Assessing Ileostomies in newborn in the span of 15-year period from July 2006 to June 2021, this research was carried out at a tertiary care multispecialty hospital, utilizing a hospital-based observational design. The study encompassed both inborn and out-born infants who required ileostomy after birth, neonatal care was provided according to established hospital protocols. The study excluded newborns with birth asphyxia, life-threatening congenital malformations, and identified causes for neurological deficits. Institutional Ethics Committee clearance was obtained to ensure ethical standards. The variables examined included indications for ileostomy, gestational age at birth, day of life when ileostomy was performed, weight at the time of ileostomy, age at ileostomy closure, and outcomes categorized as recovery, death, leaving against medical advice, or transfer to another hospital. A dedicated one-year follow-up was done in 38 patients undergoing ileostomy to assess their neurological status, neurological well-being was determined by assessing appropriate developmental milestones, the absence of motor or sensory impairments, and the absence of neurological abnormalities identified through clinical examination. The statistical analysis involved tabulating data and using SPSS version 16, with the Shapiro-Wilk test for assessing normal distribution in continuous variables, mean for normally distributed data, and median for skewed data.

Results

Patient Demographics:

A total of 65 infants underwent ileostomy from July 2006 to July 2021 in a tertiary care multispecialty hospital. Of these, 48 (73.8%) were males, and 17 (26.2%) were females.

Indications for Ileostomy:

The most prevalent cause of ileostomy was necrotizing enterocolitis (55.4%, n=36), followed by Hirschprung disease (18.5%, n=12), and ileal atresia (7.7%, n=5). Other causes included spontaneous intestinal perforation (4.6%, n=3), volvulus (3.1%, n=2), gut of prematurity (3.1%, n=2), exomphalus minor with small bowel obstruction (1.5%, n=1), and meconium ileus (3.1%, n=2).

Gestational Age Distribution:

The mean gestational age at birth was 33 weeks (± 4 weeks SD), with the lowest at 26 weeks and the highest at 39 weeks.

Age of Ileostomy:

The mean age of ileostomy was 16 days. Lowest age at which ileostomy was done was 2 days and highest age was 77 days. Majority of the babies had ileostomy in the first week of life (43%, n=28)

followed by ileostomy in 2 week and 4 week of life (22% and 17% babies respectively).In 7 babies, ileostomy was done in 3 week of life th while in 5 babies ileostomy was done in 4 week of birth.

Weight at Ileostomy:

The mean weight at ileostomy was 2.04 Kg (± 0.96 Kg), ranging from 580 grams to 3.8 Kg.

Outcome:

Out of the 65 ileostomies, 69.2% (n=45) resulted in recovery and discharge, 20% (n=11) in death, 7.7% (n=5) in leaving against medical advice, and 6.1% (n=4) in transfer to other hospitals.

Clinical Profile of Babies That Expired:

The majority of the deceased infants were extremely premature (73%) with extremely low birth weight (55%), and the leading cause of ileostomy in these cases was necrotizing enterocolitis (73%). Most infants had additional complications such as sepsis and respiratory distress syndrome.

Ileostomy Closure and Complications:

Among the 45 recovered babies, 38 returned for ileostomy closure. The mean age at ileostomy closure was 4 months 4 days (± 2 months 18 days SD). Lowest age at which Ileostomy closure was done was 12 days and highest age was 13 months 12 days. Post-operative complications were observed in 33.8% of cases, including conjugated hyperbilirubinemia, failure to thrive, prolapse, adhesions, wound dehiscence, ileostomy site hernia, large volume ileostomy loss, diarrhea, metabolic acidosis, and short bowel syndrome.

Neurological assessment one year post ileostomy : Thirty eight were followed up for one year post ileostomy, out of this 35 demonstrated neurological normalcy in alignment with age-appropriate developmental milestones.

Discussion

In our investigation spanning 15 years (July 2006 to July 2021), 65 infants underwent ileostomy, with a notable male preponderance (73.8%). This aligns with findings by Hee Yang et al.¹¹, reporting 67% males and 33% females. Conversely, F. Ferrara et al.⁹ observed a more balanced gender distribution of 42% males and 58% females among 33 infants with ileostomy. A study by Simon Kargl et al.¹⁰ demonstrated a 1:1 gender ratio.

The predominant indication for ileostomy in our study was necrotizing enterocolitis (55.4%), followed by Hirschsprung disease (18.5%) and ileal atresia (7.7%). Similar patterns were observed in studies by Ferrara et al.⁹, Hee Yang et al.¹¹, and Simon Kargl et al.¹⁰, emphasizing the recurrent association of necrotizing enterocolitis with ileostomy.

Examining gestational age, our study showed a mean of 33 weeks, contrasting with Simon Kargl et al.'s finding of 25 weeks¹⁰. Rajendran Ramaswamy et al.¹² noted a broader gestational range (22 to 37 weeks). Mean postnatal age for ileostomy in our study was 16 days, aligning with findings by Simon Kargl et al.¹⁰ and Rajendran Ramaswamy et al.¹², while Hee Yang et al.¹¹ reported a lower mean of 10 days.

Weight at the time of ileostomy in our study averaged 2040 grams, in line with Rajendran Ramaswamy et al. (mean 1810.5 grams) but higher than Simon Kargl et al.¹⁰ and Hee Yang et al.¹¹ studies.

Regarding outcomes, the majority of infants (69.2%) in our study recovered, while 20% died, 7.7% left against medical advice, and 6.1% were transferred. This aligns with a study by M. Crealey et al.¹³, where 50% of infants were discharged home. For those who left against medical advice, all had advanced necrotizing enterocolitis, necessitating parental counseling.

The infants who expired were predominantly extremely premature and had extremely low birth weight, with necrotizing enterocolitis being the leading cause. These infants often presented with additional complications such as sepsis and respiratory distress syndrome. Similar findings were seen in other studies which showed that in VLBW infants, postoperative deaths are due to sepsis, progressive abdominal catastrophes and concomitant diseases of prematurity¹⁴⁻¹⁵

Ileostomy closure occurred at a mean age of 4 months and 4 days in our study, similar to Simon Kargl et al.'s mean of 97 days(Range was 42 to 149 days)¹⁰. Complications post-ileostomy were seen in 33.8% of cases, including hyperbilirubinemia and wound dehiscence, consistent with findings by

Simon Kargl et al which reported stoma prolapse, prestomal obstruction, stoma retraction, high output stoma, peristomal skin excoriation, and stomal ischemia as common complications¹⁰.

Thirty eight were followed up for one year post ileostomy, out of this 35 demonstrated neurological normalcy in alignment with age-appropriate developmental milestones. This positive outcome suggests that neonates who underwent ileostomy and exhibited normal neurological parameters at birth continued to progress favorably in their neurological development over the first year of life. The findings from this one-year follow-up underscore the favorable neurological outcomes in infants with ileostomy who initially presented with normal neurological profiles. This information contributes valuable insights to clinicians managing similar cases and emphasizes the importance of continued monitoring for early detection of any potential neurological issues.

This observational study, encompassing a substantial cohort, provides a comprehensive evaluation of the short-term course of newborns undergoing ileostomy. Future studies could explore the long-term outcomes of such infants. While the results are promising, the study acknowledges potential limitations, including the need for extended follow-up to assess long-term neurological outcomes. Future research endeavors may explore the impact of specific clinical variables on neurological development in this population, offering a more nuanced understanding of factors influencing outcomes.

In conclusion, our 15-year observational study on neonates undergoing ileostomy reveals crucial insights into this vulnerable population. The preeminence of necrotizing enterocolitis as the primary indication aligns with existing literature, emphasizing the persistent association between this condition and ileostomy. Our findings affirm the significance of gestational age, age at ileostomy, and weight at the time of the procedure in influencing outcomes. The one-year neurological follow-up underscores the overall favorable outcomes in infants with ileostomy, particularly those with normal neurological profiles at birth. While encouraging, our study calls for extended follow-ups and further investigations into long-term outcomes, ensuring a more nuanced understanding for improved perinatal management strategies.

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