Original Article | J Adv Med Biomed Res. 2025; 33(156): 68-72

Journal of Advances in Medical and Biomedical Research | ISSN:2676-6264

Complications and Outcomes in Neonates with Gastrointestinal Atresia: A Study at Shahid Sadoughi Hospital, Yazd

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Article Info

10.30699/jambr.33.156.68

Received: 2024/10/25;
Accepted: 2025/03/02;
Published Online: 13 Mar 2025;

Use your device to scan and read the article online

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ABSTRACT

Background & Objective: Intestinal atresia stands as a prevalent cause of neonatal intestinal obstruction, necessitating surgical intervention. Given the susceptibility of these patients to complications and potential mortality, this study aims to explore the complications and outcomes associated with intestinal atresias.

Materials & Methods: This retrospective cohort study encompassed 59 patients with intestinal atresia evaluated at Shahid Sadoughi Hospital in Yazd between 2016 and 2021. Demographic data, atresia location, concurrent anomalies, complications, and outcomes were documented and analyzed.

Results: 59 patients with intestinal atresia, 22 boys and 37 girls, with a mean gestational age of 36.23 ± 2.61 weeks, were evaluated.Duodenal atresia was present in 39%, jejunal atresia in 28.8%, ileal atresia in 8.5%, colonic atresia in 5.1%, and concurrent jejunal and ileal atresia in 18.6% of cases. The predominant associated anomaly was cardiac (39%). Post-surgery, oral feeding commenced on average by day 8, with a complete transition to enteral nutrition by day 21. Thirty-four neonates (57.6%) necessitated a central venous line for TPN administration, with an average parenteral nutrition duration of approximately 14 days. Early postoperative complications included apnea (32.2%), anastomotic leak (10.2%), sepsis (25.4%), and wound dehiscence and infection (5.1%). Short bowel syndrome developed in 15.3% post-treatment. Late complications involved cholestasis (20.3%), chronic diarrhea (10.2%), chronic constipation (3.4%), and adhesive bowel obstruction (23.7%). The mortality rate was 15.3%, with the highest mortality associated with duodenal atresia (44.4%).

Conclusion: A comprehensive assessment for concurrent anomalies, prompt treatment, and suitable nutritional support prove instrumental in mitigating complications and mortality in patients with intestinal atresia.

Keywords: Intestinal Atresia, Follow-up, Short Bowel Syndrome

1. Introduction

Intestinal atresia is among the most common reasons for intestinal blockage in newborns, occurring in approximately 0.4 to 3.1 cases per 10,000 live births (1). Despite advancements in reducing short-term complications associated with intestinal atresia, these conditions still pose risks of postoperative complications, long-term morbidities, and mortality (2). The long-term complications in these infants mainly arise from intestinal dysfunction and extended dependence on parenteral nutrition (PN) (3). The extended use of central lines for PN places these patients at risk of sepsis and bacterial overgrowth in the compromised intestine. Moreover, sustained dependence on PN correlates with cholestasis and liver disorders (4, 5). Apart from complications tied to intestinal resection during surgical correction, motility and functional disturbances in the remaining intestine contribute to the emergence of complications (6). This study explores the complications and outcomes of neonates with intestinal atresia to facilitate preventive measures and diminish future occurrences.

2. Materials and Methods

This retrospective cohort study was initiated following approval from the Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, under the ethics

code IR.SSU.MEDICINE.REC.1400.244. Medical records of all patients treated for gastrointestinal atresias at Shahid Sadoughi Hospital between 2016 and 2021 were meticulously reviewed. Patient data encompassing demographic details, anatomical classification and location of atresia, postoperative management, necessity of central venous line (CV line) insertion, the incidence of short bowel syndrome, requirement for total parenteral nutrition (TPN), presence of cholestasis, mortality rates, and patient outcomes during a one-year follow-up were documented. Short bowel syndrome is characterized by a small intestinal length of less than 50 cm in preterm neonates (28 to 35 weeks), less than 75 cm in term neonates, and under 100 cm in older children (7). Cholestasis was identified in patients with direct bilirubin levels equal to or exceeding 2.0 mg/dL (8).

2.1 Inclusion Criteria

All patients diagnosed with gastrointestinal atresia confirmed through prenatal ultrasound, clinical manifestations, medical history, radiological findings, and surgical reports from 2016 to 2021 were included in the study.

2.2 Exclusion Criteria

Inability to maintain patient follow-up. The collected data underwent analysis utilizing SPSS version 21 software and pertinent statistical techniques, including descriptive statistics, Chi-square, T-tests, and ANOVA tests. A significance level of $p < 0.05$ was considered statistically notable.

3. Results

A total of 59 patients with intestinal atresia were diagnosed and treated between 2016 and 2021. Among these patients, 22 (37.3%) were male and 37 (62.7%) were female. Vaginal delivery was noted in 23 children (39%), while 36 (61%) were delivered via cesarean section.

The most prevalent site of intestinal atresia was the duodenum (23 cases), followed by the jejunum (17 cases), ileum (5 cases), and colon (3 cases). Concomitant jejunal and ileal atresia were observed in 11 patients (18.6%).The mean gestational age of the patients was 36.23 ± 2.61 weeks. A significant relationship was found between the site of atresia and gestational age (P value: 0.004).

The average birth weight was 2522.52 ± 606.9 grams. Birth weights varied across different types of atresia: 2741.69 grams (SD: 512.24) for duodenal atresia, 2581.76 grams (SD: 623.62) for jejunal atresia, 2348 grams (SD: 601.76) for ileal atresia, 2916.66 grams (SD: 202.07) for colonic atresia, and 1944.54 grams (SD: 48794) for concomitant jejunal and ileal atresia (P value: 0.003).

Associated anomalies were present in 29 neonates (49.2%). Cardiac anomalies were predominant (39%), followed by skeletal anomalies (5.1%) and other anomalies (5.1%). There was no significant associations between the site of atresia and sex (P value: 0.17) or the presence of anomalies (P value: 0.8).

The average hospitalization duration was 20.50 ± 26.42 days, with no correlation between the atresia type and length of stay (P value: 0.12). Oral feeding commenced approximately 8 days post-surgery (3-30 days), and full enteral energy intake was achieved at day 17.21 ± 21.72. Thirty-four neonates (57.6%) required a central venous (CV) line for TPN administration. The mean duration of parenteral nutrition was 17.77 ± 14.32 days. No statistically significant relationships were found between the atresia type and the intravenous feeding duration or the time to achieve full enteral nutrition (P value: 0.1, P value: 0.26).

Early postoperative complications (within 1 month) included apnea in 19 patients (32.2%), anastomotic leak in 6 patients (10.2%), sepsis in 15 patients (25.4%), and wound dehiscence and infection in 3 patients (5.1%).

After surgical correction, 9 patients (15.3%) - 7 girls and 2 boys out of the total 59 patients - developed short bowel syndrome (P value: 0.46). Among them, 2 had jejunal atresia, 1 had ileal atresia, 2 had colonic atresia, and 4 had combined jejunal and ileal atresia.

Late postoperative complications comprised cholestasis in 12 patients (20.3%), chronic diarrhea in 6 patients (10.2%), chronic constipation in 2 patients (3.4%), and bowel obstruction due to adhesions in 14 patients (23.7%).

The mortality rate was 15.3% (9 out of 59 patients). Four patients had duodenal atresia, one had jejunal atresia, one had colonic atresia, and three had combined jejunal and ileal atresia (P value: 0.38). Among the deceased patients with short bowel syndrome, two had cardiac anomalies, one had skeletal anomalies, and one had other anomalies. Sepsis was present in five of the deceased patients.

4. Discussion

Recent advancements in surgical methods, the increased use of intravenous nutrition, and lower neonatal mortality rates related to intestinal atresia have highlighted the importance of long-term complications in these patients. The survival of individuals with short bowel syndrome, supported by intravenous nutrition, has led to a rise in complications like sepsis and liver failure (1). This study, conducted to explore the complications and outcomes of neonates with gastrointestinal atresia hospitalized at Shahid Sadoughi Hospital in Yazd between 2016 and 2021, revealed a reported prevalence of duodenal atresia at 39%, aligning with findings from other studies citing duodenal atresia prevalence between 30% and 50% (9, 10). Some research indicates a concurrent occurrence of cardiac anomalies in about 20-25% of neonates with duodenal atresia (10).

In this study, 47.8% of patients with duodenal atresia exhibited a coexisting cardiac anomaly. Discrepancies may arise from sample size and study location.

Clinical symptoms in neonates with duodenal atresia usually appear within the first one or two days after birth, presenting as obstructive signs such as persistent vomiting, bilious vomiting, gastric distension, or difficulties with feeding (11). Here, the average onset age of clinical symptoms in duodenal atresia was 2.21 days. While the long-term prognosis for duodenal atresia is generally favorable, complications and mortality often stem from associated anomalies and short bowel syndrome necessitating extended total parenteral nutrition (6). In this study, approximately 17% of neonates with duodenal atresia died.

The incidence of jejunoileal atresia in Europe ranges from 0.3 to 1.1 per 10,000 births (12). In this study, jejunal and ileal atresia incidences were 28.8% and 8.5%, respectively. The male-to-female ratio in jejunoileal atresia studies typically falls around 1.2 (13-15). Conversely, our study observed 10 male and 23 female patients affected by jejunal and ileal atresias, a deviation from reported ratios.

The mortality rate in the group with jejunal and ileal atresia was 12.1% (4 out of 33 patients), aligning with rates ranging from 10% to 16% in most studies (2) but occasionally varying from 3.5% to 30% in limited research (16, 17).

Short bowel syndrome affected 15.3% of patients in this study, with 10.01% in the jejunal and ileal atresia groups, akin to findings in other studies (18).

Colonic atresia, more prevalent in males, typically manifests with distal intestinal obstruction symptoms within the initial two days of life (19-21). In our study, the mean age at colonic atresia diagnosis was 1.52 ± 2.33 days.

A Netherlands study on 114 jejunal atresia cases reported 26% requiring re-enterostomy, 15% developing short bowel syndrome, 47% needing long-term parenteral nutrition via central venous lines, and an approximately 11% mortality rate (2). In our study, the mortality rate for patients with jejunal atresia was 5.9%, lower than the study above, while rates of short bowel syndrome and central venous line dependency were comparable.

This study faced limitations including a small sample size and data collection from a single center, limiting generalizability. Future multi-center studies with larger samples could offer more comprehensive insights.

5. Conclusion

Early identification of associated anomalies and advancements in surgical and critical care have enhanced survival in neonates with intestinal atresia. However, short bowel syndrome persists as a primary long-term complication, leading to extended hospital stays, sepsis, and mortality.

6. Declarations

6.1 Acknowledgments

The researchers express their gratitude to the study participants, their families, and all personnel at Shahid Sadoughi Hospital.

6.2 Ethical Considerations

The research plan of this study was approved by the Research Ethics Committee of Shahid Sadoughi University of Medical Sciences, Yazd, with code: IR.SSU.MEDICINE.REC.1400.244.

6.3 Authors' Contributions

SR. M and M.N S conceptualized and designed the study. MH.L, M.A B and A. A provided the data. R. E. conducted the statistical analysis and data interpretation and wrote and revised the manuscript. All authors have read and approved the final version of the manuscript. The final manuscript was read and approved by all of the authors.

6.4 Conflict of Interest

The authors declare that there are no conflicts of interest.

6.5 Fund or Financial Support

This research received no specific grant from any funding agency in the public, commercial, or not for profit sector.

6.6 Using Artificial Intelligence Tools (AI Tools)

The authors were not utilized AI Tools.

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How to Cite This Article:

Mirjalili S R, Edalatkhah R, Amouei A, Noorishadkam M, Lookzadeh M H, Ahmadi Bidakhavidi M. Complications and Outcomes in Neonates with Gastrointestinal Atresia: A Study at Shahid Sadoughi Hospital, Yazd. J Adv Med Biomed Res. 2025;33(156):68-72.