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ORIGINAL ARTICLE

# Risk Factors and Predictive Models of Abdominal Wound Dehiscence in Pediatric Age

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## ABSTRACT

**Background**: Abdominal wound dehiscence (AWD) is a serious postoperative complication in pediatric surgical patients, associated with increased morbidity, prolonged hospital stay, and, in severe cases, mortality. Data regarding risk factors and predictive models for AWD in pediatric populations remain limited. This study aimed at formulating predictive models related to abdominal wound dehiscence in pediatric patients who had undergone abdominal surgical procedures.

**Methods**: This prospective study was conducted in Zagazig university hospitals, total of 48 pediatric patients undergoing major abdominal surgery were included. The median age was 41 days (range: 4–350), with 34 males (70.83%) and 14 females (29.17%). The mean body mass index (BMI) was 18.72±0.7kg/m². Patient demographics, clinical risk factors, surgical characteristics, and postoperative outcomes were systematically recorded. Wound dehiscence was classified as partial or complete. Patients were stratified into two groups: those with AWD (Group A, n=5) and those without AWD (Group B, n=43).

**Results**: The overall incidence of AWD was 10.42% (5/48). Patients in Group A tended to be younger, but age and sex differences were not statistically significant. Hypoproteinemia was significantly more common among AWD patients (60%vs. 6.98%, P=0.0004). Operative factors significantly associated with AWD included longer incision length (6.6±1.17vs. 4.81±1.41cm, P=0.0339) and vertical incision type (80%vs. 18.6%, P=0.0021). Postoperative coughing was also significantly higher in the AWD group (40%vs. 6.98%, P= 0.0219). Multivariate logistic regression identified hypoproteinemia (P=0.001), incision length (P=0.032), and postoperative coughing (P=0.01) as independent predictors of AWD.

**Conclusion**: Hypoproteinemia, longer incision length, and postoperative coughing are independent predictors of AWD in pediatric patients. Optimizing nutritional status, minimizing incision size, and controlling postoperative respiratory complications are essential to reduce the risk of AWD, particularly in neonates and young children.

**Keywords**: Pediatric Surgery; Risk Factors; Hypoproteinemia; Incision Length; Predictive Models

## INTRODUCTION

Abdominal wound dehiscence represents a serious complication following abdominal surgical procedures in pediatric patients. Its sudden onset and the frequent necessity for surgical re-intervention underscore the distressing nature of this condition, affecting both young patients and their families. Despite its clinical importance, the scientific literature regarding risk factors for abdominal wound dehiscence in children

remains limited. Reported incidence rates vary between 0.2% and 1.2%, with mortality rates reaching as high as 45% [1,2]. Dehiscence typically arises as a consequence of infected surgical wounds and reflects a disruption of the normal healing process. It is associated with delayed recovery, increased morbidity, elevated mortality, and prolonged hospitalization [3,4]. This phenomenon, sometimes referred to as the "mechanical failure of incision wound healing," represents a significant deterioration in the healing cascade. Normally, surgical incisions undergo a four-phase healing process: hemostasis, inflammation, proliferation, and maturation. Hemostasis involves platelet aggregation, activation of coagulation pathways, and clot formation, followed by clot degradation, capillary dilation, and complement activation [5]. Macrophages, neutrophils, and lysed cells then release essential cytokines and growth factors, supporting subsequent repair.

The proliferative phase begins around the third postoperative day and may last several weeks. During this phase, fibroblasts migrate to the wound site, synthesize collagen, and facilitate granulation tissue formation. The maturation phase commences around the seventh postoperative day, involving collagen remodeling and deposition that enhance tensile wound strength [6,7]. Nutritional status has a profound impact on these processes. Malnutrition, a frequent comorbidity in surgical patients, is known to impair immune function, compromise cardiopulmonary capacity, and delay tissue repair. Although direct causality can be difficult to establish, malnourished patients consistently demonstrate increased morbidity and longer hospital stays compared with their well-nourished counterparts [1,8]. Optimal nutrition supports each stage of wound healing, whereas protein-energy malnutrition and stress-induced catabolism may significantly hinder recovery. Evidence suggests that perioperative nutritional support reduces complication rates, particularly in patients at high risk of severe infection. Most cases of abdominal wound dehiscence in pediatric patients are observed following major laparotomy for conditions such as intussusception, typhoid perforation, bowel anastomosis, colostomy closure for anal atresia, or the pull-through procedure for Hirschsprung's disease. Reported risk factors include malnutrition, hypoalbuminemia, sepsis, obesity, male sex, very young age (particularly neonates and infants), emergency procedures, and the type of incision performed [1,9]. Waldhausen and Davies highlighted vertical incisions as a risk factor compared with transverse approaches [10,11]. Their findings also suggest a higher prevalence of dehiscence in children younger than one year. Similarly, Çığdem et al. [12] reported that neonatal age and the use of median incisions increase the risk of this complication

## AIM OF THE WORK

This study aimed at identifying significant risk factors related to abdominal wound dehiscence in pediatric patients who had undergone abdominal surgical procedures.

## METHODS

The Pediatric Surgery Department at Zagazig University Hospitals served as the site of this prospective study, conducted over a six-month period from January 2024 to July 2024. A total of 48 pediatric patients who underwent major abdominal surgical procedures were included. Surgical incisions were classified into three categories: Type I (clean incision), defined as a sterile incision sutured under aseptic conditions; Type II (possibly contaminated incision), referring to a sutured incision that might have been exposed to contamination during the surgical procedure; and Type III (contaminated incision), describing an incision involving adjacent infected tissue or one directly exposed to an infectious source. Inclusion Criteria ware all patients under 18 years old who were admitted during the study period and who underwent major abdominal surgical procedures. (Major surgery was defined as a surgical procedure that involved significant intervention in the abdominal region and

was associated with a higher risk of abdominal wound dehiscence) [13]. With no prior history of abdominal wound dehiscence. Patients were excluded if they underwent minor abdominal surgical procedures, were immunocompromised, or were receiving corticosteroid therapy. All patients included in the study were subjected to a structured evaluation protocol that encompassed demographic data including age, sex, and weight, were systematically recorded for each patient. Body mass index (BMI) was calculated according to the standard formula: weight (kg) divided by height squared ($m^2$). Clinical evaluation was conducted to identify conditions previously recognized as potential risk factors for abdominal wound dehiscence. Specific conditions assessed included anemia, defined as venous hemoglobin (Hb) <130 g/L or peripheral Hb ≤145 g/L within two weeks of birth, and venous Hb ≤115 g/L after two weeks of age (48); hypoproteinemia, defined as serum albumin <35g/L (48); and jaundice, defined as yellow discoloration of the skin and sclera associated with serum bilirubin >12 mg/dL in full-term neonates within the first 48 hours of life, >15 mg/dL (256 µmol/L) at any time, >1 mg/dL in infants aged 1 month to 1 year, or >3 mg/dL in children older than 1 year (48). Other risk factors assessed included the presence of pulmonary disease (such as asthma, bronchiolitis, pneumonia, respiratory distress syndrome, or viral respiratory infections), corticosteroid use, parental smoking, sepsis, ascites, the type and duration of surgery, and whether the procedure was performed as an emergency or an elective operation. Detailed data regarding abdominal wound dehiscence were systematically collected. The type of dehiscence was documented for each patient. *Partial wound dehiscence* was defined as rupture of a surgical incision along the suture line, with exposure of skin and/or deep abdominal tissues while maintaining fascial integrity, such that viscera and omentum were not visible. *Complete wound dehiscence* was diagnosed when the intestine, omentum, or other viscera were visible through the abdominal wound. In addition, the potential causes of dehiscence in each case were identified, along with documentation of postoperative complications, such as coughing, vomiting, and wound infection. At the conclusion of the study, patients were stratified into two groups: Group A, consisting of those who developed wound dehiscence, and Group B, consisting of those who did not. This structured approach was implemented to enable a comprehensive assessment of each patient's risk profile, thereby contributing to the development of predictive models and more effective preventive and therapeutic strategies for abdominal wound dehiscence.

***Ethical considerations:***

The Zagazig University Faculty of Medicine's Institutional Review Board and Research Ethical Committee gave their approval to the study protocol (IRB#184/12-March-2024). The study protocol was reviewed and approved by the Research Ethics Committee. Informed written consent was obtained from the guardians of all participants prior to enrollment, after providing a clear explanation of the study's objectives, potential benefits to the patient and the community, and the right to refuse participation without any impact on the child's management. Participants' guardians were assured that all collected data would be used strictly for scientific purposes and that confidentiality would be fully maintained, with no use of the data outside the scope of this study without explicit approval. Communication channels with the researchers were made available to guardians for clarification of any aspect of the study. Guardians were also informed that they would be provided with the study results. Importantly, participants retained the right to withdraw from the study at any time without the need to provide justification. In compliance with the World Medical Association's Code of Ethics for research involving human beings and the 1964

Declaration of Helsinki and its subsequent amendments, the study was carried out.

***Statistical analysis***

Data collected from patient history, clinical examination, laboratory investigations, and outcome measures were coded, entered, and initially analyzed using Microsoft Excel. The data were then imported into the Statistical Package for the Social Sciences (SPSS, version 20.0; IBM Corp., Armonk, NY, USA) for further analysis. Qualitative variables were expressed as frequencies and percentages, while quantitative continuous variables were presented as mean ± standard deviation (SD). Associations between qualitative variables were tested using the Chi-square ($\chi^2$) test. Differences between quantitative independent groups were analyzed using either the independent samples *t*-test or the Mann–Whitney U test, as appropriate. Logistic regression analysis was employed to identify independent predictors. A *p*-value of <0.05 was considered statistically significant, while a *p*-value of <0.001 was considered highly significant.

## RESULTS

The study included 48 pediatric patients with a median age of 41 days (range: 4–350 days). Among them, 34 (70.83%) were males and 14 (29.17%) were females. The mean body mass index (BMI) was 18.72 ± 0.7 kg/m² (Table 1). Regarding the preoperative status of the studied group, jaundice emerged as the most common risk factor, affecting over half of the patients (56.25%), as shown in Table 2. This was followed by anemia (20.83%) and pneumonia (18.75%). Other identified risk factors included viral respiratory infections (16.67%), sepsis (14.58%), hypoproteinemia (12.5%), parental smoking (10.42%), bronchiolitis (4.17%), respiratory distress syndrome (6.25%), and ascites (2.08%), though these were observed at lower frequencies. In terms of operative characteristics presented in Table 2, large bowel surgeries were the most frequently performed 15 patients (31.25%) underwent large bowel surgery and another 11 (22.92%) had procedures involving the small bowel. Surgeries of the stomach and pylorus were performed in 10 patients (20.83%), while 9 patients (18.75%) underwent abdominal wall surgery. Surgeries of the gall bladder, bile duct and liver were done in 3 patients only (6.25%). The mean operative duration was 127.2±36.66 minutes, and the average incision length was 5±1.49cm. The mean hospital stay was 3.89±1.03 days. Horizontal incisions were used in 36 patients (75%), while vertical incisions were employed in 12 patients (25%). Postoperative complications were reported in several patients. Wound infection was the most common (14.58%), followed by wound dehiscence (10.42%), coughing (10.42%), and vomiting (8.33%) (Table 3).When comparing patients with wound dehiscence (Group A, n = 5) to those without (Group B, n = 43), Group A tended to be younger, although the difference did not reach statistical significance (P = 0.0788). Gender distribution and BMI also showed no significant differences between the two groups (Table 4). Preoperative risk factor analysis demonstrated a significant association between hypoproteinemia and wound dehiscence (60% in Group A vs. 6.98% in Group B, P = 0.0004). No other preoperative factor showed a statistically significant difference between the two groups (Table 4). Operative variables revealed that incision length was significantly greater among patients with wound dehiscence (6.6 ± 1.17 cm) compared to those without (4.81 ± 1.41 cm, P = 0.0339). Moreover, vertical incisions were significantly more frequent in Group A (80%) than in Group B (18.6%) (P = 0.0021). Other operative characteristics, including type of surgery, operative duration, and hospital stay, did not differ significantly between groups (Table 5). Postoperative analysis demonstrated that coughing was significantly more frequent in patients with wound dehiscence (40% vs. 6.98%, P = 0.0219). Wound infection was also more common in Group A, but the difference did not reach statistical significance (Table 5). Table 6; showed that there was significant

positive association between the incidence of wound dehiscence and hypoproteinemia (P=0.001), incision length (P = 0.032), and postoperative coughing (P = 0.01) as independent predictors of abdominal wound dehiscence in pediatric patients. Vertical incision type showed a trend toward association but did not achieve statistical significance (P = 0.077).

**Table (1):** Basal characteristics among the studied groups (N = 48)

| | **All cases (N = 48)** |
|---|---|
| **Age (Days)** | **41 (4 - 350)** |
| **Sex** | |
| • **Male** | **34 (70.83%)** |
| • **Female** | **14 (29.17%)** |
| **BMI (Kg/m$^2$)** | **18.72 ± 0.7** |

BMI: Body mass index.

**Table (2):** Distribution of Pre-operative Risk Factors and Operative Characteristics Among the Studied Group (N = 48)

| | **All cases (N = 48)** | **Percentage** |
|---|---|---|
| **Pre-operative risk factor** | | |
| **Anemia** | **10** | **20.83%** |
| **Hypoproteinemia** | **6** | **12.5%** |
| **Jaundice** | **27** | **56.25%** |
| **Bronchiolitis** | **2** | **4.17%** |
| **Pneumonia** | **9** | **18.75%** |
| **RDS (respiratory distress syndrome)** | **3** | **6.25%** |
| **Viral Respiratory Infections** | **8** | **16.67%** |
| **Parental smoking** | **5** | **10.42%** |
| **Sepsis** | **7** | **14.58%** |
| **Ascites** | **1** | **2.08%** |
| **Operation characters** | | |
| **Type of surgery** | | |
| • **Abdominal wall** | **9** | **18.75%** |
| • **Stomach-pylorus** | **10** | **20.83%** |
| • **Small bowel** | **11** | **22.92%** |
| • **Large bowel** | **15** | **31.25%** |
| • **Gall bladder/bile duct/liver** | **3** | **6.25%** |
| **Operative duration (min)** | **127.2 ± 36.66** | |
| **Incision length (cm)** | **5 ± 1.49** | |
| **Hospital stay (days)** | **3.89 ± 1.03** | |
| **Surgical incision type** | | |
| • **Vertical** | **12** | **25%** |
| • **Horizontal** | **36** | **75%** |

**Table (3):** Post-operative complication distribution among the studied group (N=48)

| | All cases (N = 48) | Percentage |
|---|---|---|
| **Wound dehiscence** | **5** | **10.42%** |
| **Coughing** | **5** | **10.42%** |
| **Vomiting** | **4** | **8.33%** |
| **Wound infection** | **7** | **14.58%** |

**Table (4):** Comparison between Cases with and without wound Dehiscence regarding Basal Characteristics and Pre-operative Risk Factors

| | Group (A) Wound dehiscence (N = 5) | Group (B) No wound dehiscence (N = 43) | P. Value |
|---|---|---|---|
| **Basal Characteristics** | | | |
| **Age (Days)** | **25 (6 - 53)** | **41 (4 - 350)** | **0.0788** [MWU] |
| **Sex** | | | |
| • **Male** | **2 (40%)** | **32 (74.42%)** | **0.1137** [X] |
| • **Female** | **3 (60%)** | **11 (25.58%)** | |
| **Underweight** | **1 (20%)** | **10 (23.26%)** | **0.8732** [X] |
| **BMI (Kg/m$^2$)** | **18.28 ± 0.65** | **18.77 ± 0.69** | **0.8122** [MWU] |
| **Pre-operative Risk Factors** | | | |
| **Anaemia** | **1 (20%)** | **9 (20.93%)** | **0.7239** [X] |
| **Hypoproteinaemia** | **3 (60%)** | **3 (6.98%)** | **0.0004*** [X] |
| **Jaundice** | **3 (60%)** | **24 (55.81%)** | **0.8619** [X] |
| **Bronchiolitis** | **0 (0%)** | **2 (4.65%)** | **0.98** [f] |
| **Pneumonia** | **1 (20%)** | **8 (18.6%)** | **0.9413** [X] |
| **RDS** | **0 (0%)** | **3 (6.25%)** | **0.9054** [X] |
| **Viral Respiratory Infections** | **1 (20%)** | **7 (16.28%)** | **0.837** [X] |
| **Parental smoking** | **0 (0%)** | **5 (10.42%)** | **0.7448** [X] |
| **Sepsis** | **2 (40%)** | **5 (11.63%)** | **0.0925** [X] |
| **Ascites** | **0 (0%)** | **1 (2.33%)** | **0.99** [f] |

BMI: Body mass index.
MWU: Mann Whittney U test, X: Chi square test.

**Table (5):** Comparison between cases with and without wound dehiscence regarding pre-operation risk factor and postoperative complications

| | Group (A) Wound dehiscence (N = 5) | Group (B) No wound dehiscence (N = 43) | P. Value |
|---|---|---|---|
| **pre-operation risk factor** | | | |
| **Type of surgery** | | | |
| • **Abdominal wall** | **1 (20%)** | **8 (18.6%)** | **0.9413** [X] |
| • **Stomach-pylorus** | **1 (20%)** | **9 (20.93%)** | **0.837** [X] |
| • **Small bowel** | **1 (20%)** | **10 (23.26%)** | **0.8732** [X] |
| • **Large bowel** | **1 (20%)** | **14 (30.5%)** | **0.9413** [X] |
| • **Gall bladder/bile duct/liver** | **1 (20%)** | **2 (6.71%)** | **0.0925** [X] |
| **Operative duration (min)** | **133 ± 30.84** | **126.52 ± 37.22** | **0.7096** [s.t] |
| **Incision length (Cm)** | **6.6 ± 1.17** | **4.81 ± 1.41** | **0.0339*** |

| | Group (A) Wound dehiscence (N = 5) | Group (B) No wound dehiscence (N = 43) | P. Value |
|---|---|---|---|
| | | | [s.t] |
| **Duration of hospital stay (Days)** | **4.6 ± 1.44** | **3.81 ± 0.93** | **0.3379** [s.t] |
| **Surgical incision type** | | | |
| • **Vertical** | **4 (80%)** | **8 (18.6%)** | **0.0021*** [X] |
| • **Horizontal** | **1 (20%)** | **35 (81.4%)** | |
| **Postoperative complications** | | | |
| **Coughing** | **2 (40%)** | **3 (6.98%)** | **0.0219*** [X] |
| **Vomiting** | **1 (20%)** | **3 (6.98%)** | **0.329** [X] |
| **Wound infection** | **2 (40%)** | **5 (11.63%)** | **0.0925** [X] |

X: Chi square test, S.T: Student t-test.

**Table (6):** Multivariate logistic regression for independent predictors of Wound Dehiscence

| | Unstandardized Coefficients | | OR | Test value | P. Value | 95.0% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | B | Std. Error | | | | Lower Bound | Upper Bound |
| **(Constant)** | **-0.296** | **0.119** | | | | **-0.536** | **-0.056** |
| **Age < 30 days** | **0.128** | **0.087** | **1.1366** | **1.471** | **0.149** | **-0.048** | **0.304** |
| **Hypoproteinaemia** | **0.38** | **0.105** | **1.4623** | **3.607** | **0.001*** | **0.167** | **0.593** |
| **Incision length** | **0.052** | **0.023** | **1.0534** | **2.218** | **0.032*** | **0.005** | **0.099** |
| **Vertical incision** | **0.146** | **0.08** | **1.1572** | **1.812** | **0.077** | **-0.017** | **0.308** |
| **Coughing** | **0.299** | **0.11** | **1.3485** | **2.706** | **0.01*** | **0.076** | **0.522** |

## DISCUSSION

In this study of 48 patients (median age 41 days; 70.83% males), five developed abdominal wound dehiscence. The dehiscence group had a younger median age (25 vs. 41 days, P = 0.0788) and a lower proportion of males (40% vs. 74.42%, P = 0.1137). Underweight status and BMI were comparable between groups, with no statistically significant differences observed in any baseline characteristic (P > 0.05). The younger age observed in the wound dehiscence group may be linked to the physiological immaturity of neonates and infants, including thinner skin, reduced collagen synthesis, and an underdeveloped immune system, all of which can impair wound healing and increase susceptibility to infection [14]. Although males are generally thought to have a slightly higher risk of postoperative complications, the higher proportion of females in the dehiscence group could reflect sex-based differences in immune or inflammatory responses, or it may simply result from the small sample size[15].

Our study aligns with what was mentioned by Duan et al. [16] , as it included 453 patients, with 298 males and 155 females., and the average age at admission was $7.79 \pm 8.40$ days (range: 1–28). The mean body weight was $2.80 \pm 0.51$ kg (range: 1.9–3.8). The only marginal difference was in age (P = 0.0788).Miholjcic et al. [17] compared 16 pediatric patients with wound dehiscence to 128 without and found a statistically significant difference in age at surgery. Patients with dehiscence had a median age of 13 days (9–45), while those without had a median of 6 days (1–30) ($P < 0.01$). There was no significant difference in sex distribution ($P = 0.26$), although males were more common in both groups 81% in the dehiscence group and 64% in the non-dehiscence group. Additionally, Duan et al. [18] reported that a total of 453 cases were analyzed for risk

factors of neonatal abdominal wound dehiscence (AWD), with 27 cases of AWD, with 63% of males and 37% of females affected. Admission age did not significantly impact AWD (p = 0.240), with 51.9% of cases occurring in those under 7 days and 48.1% in those between 7–28 days. Admission weight also showed no significant association (p = 0.562), with 29.6% of cases having a weight below 2500g, while 70.4% had a weight ≥ 2500g. Found no significant associations between gender, admission age, or weight and abdominal wound dehiscence (all P > 0.05).These findings are largely consistent with those reported by Duan et al. [18] as gender showed no significant association with wound dehiscence (P = 0.750), with males comprising 63% of the affected group. Likewise, admission age was not significantly associated with dehiscence (P = 0.240), with a near-equal distribution between neonates younger than 7 days and those aged 7–28 days. Nutritional status, based on admission weight, also showed no significant association (P = 0.562), as most affected cases had a birth weight ≥2500 g. Duan et al. [16], study included 453 patients, with 298 males and 155 females. The average gestational age was $38.51 \pm 1.59$ weeks, and the average age at admission was $7.79 \pm 8.40$ days. The mean body weight was $2.80 \pm 0.51$ kg. Most wounds were horizontally oriented (337), while 116 were vertical. Among the patients, 27 cases developed abdominal wound dehiscence (AWD).In disagreement with our results, Duan et al. [18] reported a male predominance among patients with wound complications, with 298 males and 155 females out of 453 cases. The discrepancy between our findings and those of Duan et al. may be attributed to several factors. First, the sample size in our study was considerably smaller (48 patients vs. 453), which limits statistical power and may not accurately reflect sex-based trends. Second, differences in population demographics, surgical techniques, perioperative care, and underlying health conditions could influence wound healing outcomes [18]. Our study examined preoperative risk factors among 48 pediatric patients, with the most common being jaundice (56.25%), Anemia (20.38 %), and Pneumonia (18.75%). Other factors included viral respiratory infections (16.67%), sepsis (14.58%), hypoproteinemia (12.5%), Parental smoking (10.42%), RDS (6.25), bronchiolitis (4.17%), and ascites (2.08%). When comparing cases with and without wound dehiscence, hypoproteinemia was significantly more common in the dehiscence group (60% vs. 6.98%, P = 0.0004). Other factors such as anemia (P = 0.7239), jaundice (P = 0.8619), and parental smoking (P = 0.7448) showed no significant differences between the groups. Sepsis was more common in the dehiscence group (40% vs. 11.63%), but this difference was not statistically significant (P = 0.0925). No significant differences were found for bronchiolitis (P = 0.98), pneumonia (P = 0.9413), RDS (P = 0.9054), viral respiratory infections (P = 0.837), or ascites (P = 0.99). Hypoproteinemia, particularly hypoalbuminemia, significantly impairs wound healing mechanisms, thereby increasing the risk of wound dehiscence in pediatric surgical patients. Albumin plays a crucial role in maintaining intravascular oncotic pressure, which prevents fluid leakage from blood vessels into surrounding tissues Uasuwannakul, Lertudomphonwanit [19]. Our study aligns with what was mentioned by Duan et al. [16] studied 453 neonatal laparotomy cases, identifying 27 instances of abdominal wound dehiscence (AWD), yielding a 6.0% incidence rate. Key risk factors included preoperative hypoproteinemia and anemia, with severe anemia showing a significant association with increased AWD risk (p= 0.004), while hypoproteinemia was also linked to a higher incidence (p = 0.001). Additionally Miholjcic et al. [17] , compared the characteristics of patients with wound dehiscence (N = 16) and without wound dehiscence (N = 128), and found that hypoproteinemia was significantly more

common in patients with dehiscence, with a prevalence of 60% compared to 6.98% in those without dehiscence (P = 0.0004), indicating a strong statistical association .In the study by Faris and Muhammad [20], which included 48 pediatric patients, hypoproteinemia was significantly more prevalent in the wound dehiscence group, occurring in 60% of cases compared to 6.98% in those without dehiscence (P = 0.0004), indicating a strong association with impaired wound healing. Anemia was observed in 20% of the dehiscence group compared to 13.95% of the non-dehiscence group; however, this difference was not statistically significant (P = 0.7239). Our study included 48 pediatric patients, with the most frequent procedures involving the large bowel (31.25%) and small bowel (22.92%), followed by stomach-pylorus procedures (20.83%), abdominal wall procedures (18.75%) and Hepatobiliary surgery (6.25%). The mean operative duration was 127.2 ± 36.66 minutes, incision length averaged 5 ± 1.49 cm, and hospital stay was 3.89 ± 1.03 days. Horizontal incisions were used in 75% of cases. Among the five patients who developed wound dehiscence, no significant differences were found in surgical type, operative duration (P = 0.7096), or hospital stay (P = 0.3379). However, dehiscence was significantly associated with longer incisions (6.6 ± 1.17 cm vs. 4.81 ± 1.41 cm, P = 0.0339) and a higher rate of vertical incisions (80% vs. 18.6%, P = 0.0021).The significant association between wound dehiscence and both longer incisions and vertical incision orientation may be attributed to increased mechanical stress and unfavorable anatomical alignment [21]. Longer incisions expose a larger surface area to tension and potential contamination, increasing the risk of impaired healing. Vertical incisions, in particular, often intersect the natural Langer's lines of the skin and abdominal musculature, making them more prone to stress during postoperative movements such as crying or coughing especially in pediatric patients with thinner abdominal walls and immature fascial structures. These factors collectively compromise wound integrity and may explain the higher incidence of dehiscence in cases with these surgical characteristics[22] .Recent data further support the critical impact of closure technique and suture material on wound outcomes. A 2025 study from Zagazig University evaluated abdominal wall closure in gynecological oncology patients and reported a significantly higher rate of wound dehiscence with Vicryl sutures compared with polydioxanone (PDS) sutures [23]. Their conclusion that PDS provided superior fascial integrity and reduced postoperative wound complications reinforces our findings that the mechanical stability of the closure plays a decisive role in preventing dehiscence. Although their population differed in age and indication, both studies demonstrate that maintaining optimal tensile support of the abdominal wall is essential across surgical disciplines. In alignment with our study, Miholjcic et al. [17], reported that vertical incisions were significantly more common in the wound dehiscence group (4 out of 5 cases; 80%) compared to the non-dehiscence group (8 out of 45 cases; 18.6%), with a P-value of 0.0021. Additionally, the mean operative duration did not differ significantly between the dehiscence group (133 ± 30.84 minutes, N = 5) and the non-dehiscence group (126.52 ± 37.22 minutes, N = 45), with a P-value of 0.7096.Duan et al. [18], which analyzed 453 neonates undergoing laparotomy, found that vertical incisions were significantly associated with a higher risk of abdominal wound dehiscence (p = 0.001). The study also showed that operative duration had no significant impact on the occurrence of dehiscence (p = 0.622).Khan et al. [21] study included 300 pediatric patients and reported that the most common surgeries involved the small bowel (41.66%), followed by the large bowel (8.66%), stomach-pylorus (8.3%), abdominal wall (3.66%), and gall bladder/bile duct/liver (3.66%). No significant association was found between wound dehiscence and type of surgery,

operative duration (p = 0.7096), or hospital stay (p = 0.3379), aligning with our findings. A significantly higher dehiscence rate was observed with vertical incisions (p = 0.0021), which also agrees with our results. However, in disagreement with Khan et al. [21], our data showed a significant link between longer incisions and dehiscence (p = 0.0339), possibly due to the smaller sample size in our study allowing clearer detection of this effect. Our study examined post-operative complications among 48 pediatric cases, with the most common being wound dehiscence (10.42%), coughing (10.42%), vomiting (8.33%), and wound infection (14.58%). When comparing cases with and without wound dehiscence, coughing was significantly more common in the dehiscence group (40% vs. 6.98%, P = 0.0219), while no significant differences were found for vomiting (P = 0.329) or wound infection (P = 0.0925). The significant association between postoperative coughing and wound dehiscence in pediatric study likely arises from the mechanical stress exerted on healing abdominal wounds during coughing episodes. Coughing increases intra-abdominal pressure, which can strain the surgical site, particularly when the wound is still in the early stages of healing. This pressure can disrupt the sutures and tissues, leading to wound separation. Additionally, factors such as infection, hypoalbuminemia, and other comorbidities may exacerbate this risk by impairing tissue integrity and healing capacity [24]. Therefore, minimizing postoperative coughing and addressing underlying risk factors are crucial in preventing wound dehiscence[25].In alignment with our study, Sheerin et al. [26] study on 50 patients with abdominal wound dehiscence reported post-operative wound infection in 45 cases (90%), making it the most common factor. Vomiting was observed in 10 patients (20%) and coughing in 9 patients (18%). Compared to a control group without dehiscence (n = 45), coughing was significantly more frequent in the dehiscence group (40% vs. 6.98%, P = 0.0219), while vomiting showed no significant association (P = 0.329), and wound infection, though more common, did not reach statistical significance (90% vs. 68.88%, P = 0.0925).Schattenkerk et al. [1] analyzed 63 patients with abdominal wound dehiscence and 252 control subjects. Their findings align with our study regarding wound infection, which was significantly higher in the dehiscence group (24%) compared to controls (7%) (P < 0.001), as well as vomiting, which showed no significant difference between groups (8% vs. 7%, P = 0.782). However, their result on coughing reported in 5% of the dehiscence group versus 3% of controls (P = 0.425) did not agree with our findings, which showed a stronger association between postoperative coughing and dehiscence. This discrepancy may be due to differences in sample size, patient age groups, or postoperative monitoring protocols. Our study performed a multivariate logistic regression to identify independent predictors of wound dehiscence. The analysis revealed that hypoproteinemia (OR = 3.607, P = 0.001), incision length (OR = 2.218, P = 0.032), and coughing (OR = 2.706, P = 0.01) were significant predictors. Age under 30 days (P = 0.149) and vertical incision (P = 0.077) were not significant, though the latter approached statistical significance. The constant term had a negative value of -0.296 (P = 0.056). The confidence intervals for significant predictors were as follows: hypoproteinemia (0.167–0.593), incision length (0.005–0.099), and coughing (0.076–0.522). The study identified hypoproteinemia, longer incision length, and coughing as significant predictors of wound dehiscence. Hypoproteinemia impairs wound healing by reducing collagen synthesis and fibroblast function, essential for tissue repair[27]. Longer incisions increase mechanical stress on healing tissue, making them more susceptible to dehiscence. Coughing raises intra-abdominal pressure, which can disrupt sutures and wound edges, especially in abdominal surgeries. While age under 30 days and vertical incisions

showed weaker associations, the latter may increase tension on the wound, making it more prone to failure [28].In alignment with our study, Duan et al. [18] reported that among the 453 patients included in the study, 27 cases developed abdominal wound dehiscence (AWD). The study found that hypoproteinemia was a significant risk factor for AWD, with an odds ratio of 2.841 (95% CI: 1.249–6.460, P = 0.013). Similarly, incision type also emerged as a significant predictor, with an odds ratio of 2.274 (95% CI: 1.256–4.118, P = 0.007).Van Ramshorst [29] included 363 patients with abdominal wound dehiscence and 1,089 controls. Hypoproteinemia was significantly more common in the AWD group (63%) than in controls (34%), P < 0.001. Vertical incision was not a significant predictor, and coughing was notably higher in the AWD group (17%, 62/363) compared to controls (4%, 36/1089), P < 0.001, confirming it as an independent risk factor. However, incision length did not show a significant association with AWD, which disagrees with our findings (P = 0.032); this discrepancy may be due to variations in measurement methods, surgical techniques, or the use of tension-reducing strategies in longer incisions, which could have mitigated their effect on dehiscence risk. Clinical implications. three actionable themes arise: (1) preoperative optimization of protein status (screening and correcting hypoalbuminemia) should be prioritized; (2) where feasible, prefer transverse/oblique incisions and minimize incision length without compromising exposure; and (3) implement aggressive postoperative cough control and pulmonary hygiene in high-risk patients, alongside meticulous infection prevention.

***Limitations***

The study has several limitations. First, the relatively small sample size (48 cases) limited statistical power, particularly for less common risk factors. Second, the single-center design may reduce the generalizability of the findings to other institutions and populations. Third, the cross-sectional design prevents establishing causality between risk factors and the development of AWD. Finally, the absence of long-term follow-up restricted the ability to assess the extended impact of AWD on pediatric patients, including recurrence rates and long-term outcomes.

## CONCLUSIONS

In a pediatric surgical cohort, hypoproteinemia, longer incision length, and postoperative coughing independently predicted abdominal wound dehiscence. Risk reduction should focus on nutritional optimization, tension-aware incision planning, and proactive postoperative respiratory management, with special vigilance in neonates and young infants.

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