

# Relaparotomy in Children in a Developing Country: A 10-Year Review

Chukwubuike Kevin Emeka

Department of Surgery, Enugu State University Teaching Hospital, Enugu, Nigeria.

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## Abstract—

**Background:** Complications arising from abdominal surgeries may necessitate a relaparotomy. The purpose of this study was to evaluate the indications, outcome and factors affecting mortality following pediatric relaparotomy in Enugu, Nigeria.

**Methods:** This was a retrospective study of children that had relaparotomy at the pediatric surgery unit of Enugu State University Teaching Hospital, Enugu over a 10-year period. The parameters assessed included patients' demographics and other factors that may affect mortality following relaparotomy using a multivariate analysis.

**Results:** A total of 683 laparotomies were performed during the study period, out of which 31(4.5%) patients had relaparotomy. The ages of the patients ranged from 2 weeks to 15 years, with a median of 10 years. Typhoid intestinal perforation was the most common initial pathology that necessitated the initial laparotomy and right hemicolectomy with ileotransverse anastomosis was the most common initial procedure performed. Anastomotic leak (61.3%) was the most common indication for relaparotomy and surgical site infection (29%) was the most common complication following relaparotomy. Mortality rate was 19.4% and statistical analysis (multivariate analysis) showed post-operative complication as the only factor that affected mortality ( $p$  value = 0.04).

**Conclusion:** Relaparotomy is inevitable in many unsuccessful primary laparotomies. The mortality rate in developing country like Nigeria is high and efforts should be made towards improving outcome.

**Keywords:** Abdominal, children, complications, developing country, relaparotomy, review.

**What is already known about the topic:** There is no publication on pediatric relaparotomy from West African. A literature search on pediatric relaparotomy in Africa showed only one paper from Ethiopia which recorded high mortality especially in neonates.

**What does this article add:** To the best of my knowledge, this is the first article from West Africa that brings up information on pediatric relaparotomy. This article adds information on the unique experience from West Africa.

## I. INTRODUCTION

Abdominal surgeries may be associated with myriad of complications that necessitates reoperation. Simply put relaparotomy means a repeat abdominal operation after the initial operation. Most researchers define relaparotomy as abdominal surgeries performed within 60 days after the initial surgery [1,2]. There is no consensus on the classification of relaparotomy. Early or late, emergency or elective, planned or unplanned are some of the proposed classifications [3]. Survival and recovery following relaparotomy have been used by some clinicians as an indicator of the quality of surgical care [4]. Most common indications for relaparotomy include intra-abdominal fluid collection, anastomotic leak, bleeding, wound dehiscence, bowel necrosis, bowel obstruction [5,6]. Before a decision for a relaparotomy is taken, an important question has to be answered: Will reoperation make the patient's clinical condition better or worse [7]. Improvements in imaging investigations have greatly assisted surgeons in taking informed decisions [7]. It must be remembered that relaparotomy is fraught with lots of morbidity and mortality because the patient is at higher risk of wound complications and fascial dehiscence [7].

There is paucity of data on pediatric relaparotomy in Nigeria and this study will help evaluate the current state of surgical care of pediatric patients in Enugu, Nigeria. The aim of this study was to evaluate the indications, outcome and factors affecting mortality of pediatric patients who underwent relaparotomy at a teaching hospital in Enugu, Nigeria.

## II. METHODS

This was a retrospective study of children aged 15 years and below who had relaparotomy (during the same hospitalization and within 60 days) between January 2009 and December 2018 at the pediatric surgery unit of Enugu State University Teaching Hospital (ESUTH) Enugu, Nigeria. ESUTH is a tertiary hospital located in Enugu, South East Nigeria. The hospital serves the whole of Enugu State, which according to the 2016 estimates of the National Population Commission and Nigerian National Bureau of Statistics, has a population of about 4 million people and a population density of 616.0/km<sup>2</sup>. The hospital also receives referrals from its neighboring states. Patients who have had relaparotomy for the same pathology at a peripheral hospital before referral to ESUTH for reoperation were excluded from this study. Patients with incomplete medical records were also excluded from the study. Information was extracted from the medical records, operation notes, operation register, and admission-discharge records. The information extracted included age, gender, diagnosis and procedure performed at the initial laparotomy, duration between operation and reoperation, indication for relaparotomy, definitive operative procedure done at relaparotomy, number of relaparotomies, post relaparotomy complications, duration of hospital stay and outcome of treatment. Complications arising from the initial laparotomy were the indications for the relaparotomy. These complications were in the form of intestinal obstruction, anastomotic leak causing peritonitis or burst abdomen. All the laparotomies and relaparotomies were performed by consultant pediatric surgeon. There was no senior registrar in the pediatric surgery unit during the study period. The follow-up period for a possible relaparotomy was 60 days and the patients were followed up for 6 months for assessment of outcome of relaparotomy. Ethical approval was obtained from the ethics and research committee of ESUTH. Statistical Package for Social Science (SPSS) version 21, manufactured by IBM Cooperation Chicago Illinois, was used for data entry and analysis. Data were expressed as percentage, median, mean and range. Chi square or student's T test was used to test for significance. Multivariate analysis was used to evaluate the effect of the factors on outcome and p value < 0.05 was considered statistically significant. The primary outcome measure was the mortality rate and secondary outcome measure was the factors that affect the mortality following relaparotomy.

## III. RESULTS

### 3.1 Patients' demographics

There were 35 cases of relaparotomies performed during the study period but only 31 cases had complete case records and formed the basis of this report. A total of 683 laparotomies were performed during the same period which gives a relaparotomy rate of 4.5%. There were 23 males (74.2%) and 8 females (25.8%), which corresponds to a male to female ratio of 2.9:1. The ages of the patients ranged from 2 weeks to 15 years, with a median of 10 years. Regarding the initial laparotomy, 28 cases (90.3%) were emergencies whereas 3 cases (9.7%) were elective surgeries. The median interval from initial laparotomy to relaparotomy was 6 days (range 3-7). The mean duration of hospital stay was 18.3 days (range 11-23). Details are shown in Table 1.

**TABLE 1**  
**DEMOGRAPHIC PROFILE OF THE PATIENTS**

<b>Gender</b>	
Male	23 (74.2%)
Female	8 (25.8%)
<b>Age range</b>	2 weeks to 15 years (median 10 years)
<b>Nature of the initial surgery</b>	
Emergency	28 (90.3%)
Elective	3 (9.7%)
<b>Interval from initial laparotomy to relaparotomy</b>	3 to 7 days (median 6 days)
<b>Age groups</b>	
Neonates (< 1 month)	2 (6.5%)
Infants (1-12 months)	6 (19.4%)
12 months to 15 years	23 (74.1%)
<b>Duration of hospitalization</b>	18.3 days (range 11-23)

### 3.2 Diagnoses before initial laparotomy

The most common initial diagnosis that necessitated the initial laparotomy was typhoid intestinal perforation (29%). Others are shown in Table 2.

**TABLE 2**  
**DIAGNOSES BEFORE INITIAL LAPAROTOMY**

Initial diagnosis	Number	Percentage
Typhoid intestinal perforation	9	29.0
Intussusception	8	25.8
Ruptured appendix	5	16.1
Strangulated hernia	4	12.9
Colostomy closure	3	9.7
Intestinal atresia	2	6.5

### 3.3 Initial procedure performed

Right hemicolectomy with ileotransverse anastomosis was the most common initial procedure performed. Others are depicted in Table 3.

**TABLE 3**  
**INITIAL SURGICAL PROCEDURES**

Surgical procedure	Number	Percentage
*RHC with ITA	12	38.7
Peritoneal abscess drainage	8	25.8
Segmental bowel resection	8	25.8
Closure of intestinal perforation	3	9.7

*\*RHC= Right hemicolectomy, ITA=Ileotransverse anastomosis*

### 3.4 Indications for relaparotomy

The indications for relaparotomy include anastomotic leak 19 (61.3%), intra-peritoneal abscess 8 (25.8%), intestinal re-perforation from a new site 2 (6.5%), bleeding 1 (3.2%) and intestinal obstruction 1 (3.2%).

### 3.5 Number and relaparotomy procedure performed

Twenty-eight patients (90.3%) had a single re-exploration whereas only 3 patients (9.7%) were re-explored twice. Intestinal reanastomosis was performed in 16 patients (51.6%), enterostomy 9 (29%), drainage of residual abscess 5 (16.1%) and adhesiolysis for adhesive intestinal obstruction 1 (3.2%).

### 3.6 Post-operative complications following relaparotomy

Fourteen patients (45.2%) did not develop any complications. Nine patients (29%) had surgical site infection, 5 patients (16.1%) had incisional hernia and 3 patients (9.7%) had burst abdomen. Seven out of 9 patients (77.8%) that had surgical site infection had typhoid intestinal perforation as their primary pathology. The 3 patients that had burst abdomen are the patients that were re-explored twice.

### 3.7 Outcome and factors affecting mortality

Twenty-three patients (74.1%) did well and were discharged home. Two patients (6.5%) signed out against medical advice. Mortality occurred in 6 patients (19.4%). There was no mortality among the patients that were re-explored twice and re-exploration was considered an independent risk factor. The most common cause of mortality was overwhelming sepsis with multiple organ failure. Table 4 shows the result of statistical analysis of the different factors with regards to mortality.

**TABLE 4**  
**FACTORS AFFECTING MORTALITY**

Variables	Coefficients	P value
Age of the patients	0.166	0.96
Initial diagnosis	0.207	0.73
Duration of symptoms	0.097	0.56
Initial procedure	0.051	0.09
*Complications following relaparotomy	1.365	0.04
Indication for relaparotomy	0.598	0.55

*\*Statistically significant.*

#### IV. DISCUSSION

Relaparotomy has been described as a therapeutic manipulation when the healing process is incomplete [8]. Some authors have also described relaparotomy as a high-risk, no-choice operation while others call it a surgeon's nightmare [9, 10]. When adequate cleaning of the peritoneal cavity is not achieved or complications such as anastomotic leak and intestinal obstruction occur; there will be a need for relaparotomy. However, accurate and timely identification of patients in need of relaparotomy could be challenging because of lack of established prediction model [11].

In the present study, the relaparotomy rate of 5.1% is similar to the reports of Grussner et al but at variance with the report of Negussie et al [5, 12]. Tera and Aberg reported an incidence of 1% where as Lunkoet al reported 10.6% [13, 14]. The incidence of relaparotomy may depend on the expertise and skill of the operating surgeon. The male preponderance recorded in the current study is consistent with the report of a similar study done in Ethiopia [5]. However, the median age of our patients is not in agreement with the report of Negussie [5]. The reason for this is not clear but might be explained by differences in the predominant pathology. For instance, typhoid intestinal perforation, which occurs commonly in older children, was the most common indication for the initial surgery in the present study while Negussie et al reported intussusception as the most common indication in their series. When compared with elective laparotomy, emergency laparotomy is associated with lots of adverse outcomes [15]. In line with the report of other researchers, majority of our patients had emergency laparotomy. Indications for relaparotomy in our patients are similar to other reports in pediatric and adult relaparotomy [5, 16]. These indications present as emergencies that require immediate surgical re-exploration. Intervals from initial operation to relaparotomy vary widely with the indications [6]. The median period of 6 days in the present study is supported by the reports of previous workers [17, 18, 19]. However, Hasan et al and Anantha et al reported a median interval of 11.55 days and 12.3 days respectively [10, 20]. The time interval between initial operation and relaparotomy may depend on the particular complication arising from the initial operation. For instance, post-operative bleeding and anastomotic leak may present before post-operative intestinal obstruction.

Laparotomy for typhoid intestinal perforation was the most common primary surgery in the index study. Typhoid fever is systemic disease, with surgical complications, that is transmitted faeco-orally through contaminated food and water due to poor standard of hygiene and unavailability of potable water. Complications of typhoid fever are quite common in developing country. A study done in North Central Nigeriastated the need for early relaparotomy for intra-peritoneal complications arising from surgery performed for typhoid intestinal perforation [21]. However, Negussie reported intussusception as the most common indication for initial laparotomy [5]. The reason for this difference is not known but might be explained by the disease pattern in different settings.

Anastomotic leak was the most common indication for relaparotomy in the present study. This finding is consistent with the report of other researchers [19, 22]. Other important indications included bleeding and intra-peritoneal collections [5, 6]. However, cases of negative relaparotomy have been reported [23]. No negative laparotomy was recorded in the present study. Most of our patients had a single relaparotomy. All mortalities were in patients that had single relaparotomy. One study from Ethiopia reports that the number of relaparotomies is an indicator of the measure of surgical care [5]. However, another study from South Africa reported that the number of relaparotomy does affect the morbidity but not the mortality of patients that had relaparotomy [24]. In the present study, intestinal reanastomosis was the most common procedure performed at relaparotomy. However, on a background of gross peritoneal fecal contamination, we offered our patients an enterostomy. This is due to the high chance of another anastomotic leak. However, a study done in Netherlands reported

better outcome with intestinal reanastomosis despite gross peritoneal soilage [25]. Good surgical skills and possible complications of enterostomy may have informed the decision for reanastomosis.

Performing relaparotomy in children entails operating on critically ill children and is fraught with complications. Surgical site infection was the most common complication recorded in our patients post relaparotomy. Similar studies also recorded surgical site infection as a post-operative complication following relaparotomy [5, 7]. Although surgical site infection increases morbidity and hospital stay of the patients, it is not associated with mortality [26]. The high rate of surgical site infection (29%) recorded in the present study may have accounted for the long hospital stay of our patients. Surgical site infection requires repeated and prolonged wound dressing before adequate healing occurs.

The mortality rate of 19.4% recorded in the present study tallies with the report of other studies [5, 24]. Some other studies, however, reported higher mortality rates [19, 27]. The indications for relaparotomy and age group of the patients may explain the differences in mortality rates. Complication arising from relaparotomy was the only factor found to affect mortality in the present study. Amongst the complications, infective post-operative complication leading to overwhelming sepsis was found to be statistically significant ( $p = 0.001$ ) as the cause of mortality. This may be explained by the fact that complication such as burst abdomen following relaparotomy requires further operative treatment with attendant risks of anaesthesia and surgery in a child with depleted body reserves.

## V. LIMITATIONS OF THIS STUDY

1. Retrospective nature of this study: A prospective study would have provided a detailed review of the factors affecting mortality.
2. This study is limited by the small number of cases. A larger number of cases would have availed better analysis and basis for critical comparison with other published larger series.
3. This was a single institution experience which may not be generalizable to other institutions. Future multi-centre study is needed to determine the actual incidence and outcome of relaparotomy in Enugu, Nigeria.

## VI. CONCLUSION

Relaparotomy in a developing country like Nigeria is relatively common and the attendant mortality of 19.4% is high. Complication following relaparotomy was the only factor found to affect mortality in the present study. Early detection of complications, improved training of surgeons and provision of facility will improve outcome of laparotomy in children in developing countries.

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