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## **Original Article**

# Surgical Outreach in a Tertiary Healthcare Facility: A Prototype for Mass Hernia Repair among Children in Low Resource Setting

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## ABSTRACT

Hernias are common in children and account for most of the surgical operations performed by the Paediatric surgeons. They often present late in resource-poor countries for a variety of reasons. In these settings, surgical outreaches reduce the burden of hernias. We aim to determine the effectiveness of a tertiary hospital-based surgical outreach for hernia repair in children in a low-resource-setting. We did a prospective study conducted during a surgical outreach carried out over seven days at a tertiary center in Southeast Nigeria. Recruited subjects were physically examined to establish a diagnosis and screened for fitness before surgeries were performed. Data were collected using a structured proforma to information from the patient's case-notes. Data analysis was done using the statistical package for social sciences (SPSS) version 25. There were 77 children with 80 hernia surgeries, 71 (92.2%) males, and 6 (7.8%) females (ratio of 12:1) were involved. The majority (66.2%) were aged 2-12years and were mainly rural dwellers. Right groin hernias were present in 54.5% and 40.3% had left groin hernias. Herniotomy was the main procedure offered (93.5%). The complication rate was 9.1%. Senior registrars in surgery (Senior trainee surgeons) participated in most of the operations. The mean duration of surgery was 34.9 + 17.6 minutes. Surgical outreach in tertiary hospital for hernias in children in resource-poor settings offers the opportunity for mass repairs with good outcomes. It provides a hands-on opportunity for trainee surgeons to improve their mastery of the rule surgeory.

**Keywords**: Femoral hernia; Inguinal hernia; Hernia in Children; Herniotomy; Moloney darn technique; Surgical outreach.

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#### **INTRODUCTION**

A bdominal wall hernia is one of the most common surgical conditions accounting for about 90% of all the hernias in humans.<sup>1</sup> More than 20 million patients undergo hernia repair annually.<sup>2</sup> Hernias and hydroceles are common in children with associated higher morbidity, and mortality, more so among the lowincome individuals living in hard-to-reach communities predominantly in Africa.<sup>3-8</sup> Untreated hernia leads to severe psychosocial embarrassment and also loss of productivity and fertility.<sup>5,9</sup>

Nine out of ten hernias occur through the anterior abdominal wall with 90-95% of the ventral wall hernias occurring at the groin making it the commonest type of hernia with an incidence of 175 per 100,000.<sup>1, 3, 9, 10</sup> The risk factors for hernias in children include: family history,<sup>1,11</sup> previous contra-lateral hernia, male gender, age (peak prevalence at 5 years, primarily congenital and indirect)<sup>9,12</sup> abnormal collagen metabolism (a diminished collagen type I/III ratio) and low body mass index.<sup>2</sup>

The gold standard for hernia diagnosis is a clinical examination, with a sensitivity of 0.745 and a specificity of 0.963.<sup>2, 13-15</sup> Investigations such as ultrasound and magnetic resonant imaging MRI are rarely necessary to establish diagnosis.<sup>2</sup> In developed countries, a dynamic magnetic resonance imaging or computerized tomography scan or herniography could still help in the diagnosis of inguinal hernia especially when it is not easily detected during physical examination.<sup>13,14</sup>

Surgical treatment of hernia in children is mainly by herniotomy, it requires expertise because the vas deferens could easily be damaged and occasionally the sac could have uncommon content like the ovaries, caecum, appendix.<sup>7,16,17</sup> Poor access to safe surgical and anesthesia in addition to skilled manpower services, most especially in children is a rate-limiting step increasing the burden in low and middle-income countries LMIC.<sup>3,9</sup>

Health outreaches are programs organized to provide free or subsidized healthcare services to people that ordinarily would not afford the given care.<sup>18</sup> Outreaches

are usually taken to the communities but it is usually riddled with logistics challenges ranging from lack of standard theatre, and appropriate instruments, accommodation, personnel among others. It therefore, becomes necessary to objectively assess hernia repairs in children during an outreach organized in a teaching hospital and report lessons learned.

## **MATERIALS AND METHODS**

This is a prospective study conducted during a free hernia surgical outreach in children 18 years or less that was carried out at the Alex Ekwueme Federal University Teaching Hospital Abakaliki (AEFUTHA), southeast Nigeria in June 2018. We obtained ethical approval from the Research and Ethical Committee of the hospital.

The Parents with their wards were invited to predetermined sites close to their locality via electronic media and community mobilization using traditional and religious leaders, town unions, and town criers. At a prearranged date and venue, all children present were screened by a team of surgical resident doctors and nurses. Those found to have hernias were scheduled for surgery at the tertiary hospital in batches over seven days of the outreach.

Preoperative instructions of a thorough bath in the morning and at least a 4 hours fast on the night of the procedure were passed to parents/guardians. On such days, Parents and their wards were transported to and from the tertiary center where the operations were conducted. At the hospital, more detailed clinical and anaesthetic evaluations were done. Basic baseline investigations (urinalysis and packed cell volume) were done. Those found to be unfit were excluded from the program and the study.

Informed consent for surgery and anaesthesia were obtained from guardians/parents and patients booked for surgery. The surgical procedures were performed by consultant surgeons and senior registrars in surgery (senior surgical specialist trainees). Surgeries were carried out under general anesthesia, caudal block, few

older children were done with local anesthesia and sedation. Post-operatively patients were observed in the recovery room till they were fully awake from anaesthesia. They were either discharged home or admitted to the ward depending on the postoperative clinical condition.

Patients were followed up through phone calls, visit by medical social workers and health extension workers to ascertain the health status of the patient after the surgery. A week after surgeries the same team of doctors and nurses visited the venues of the screening for postoperative evaluation. Similar visits were carried out at one and three months.

All cases of children aged less than 18 years with a hernia, whose parents/guardian gave consents for surgery, and anaesthesia, were included in the study. Those excluded include patients with respiratory tract infection, overt clinical malnutrition and other comorbidities that made them unfit for surgery, and anaesthesia.

The data was entered according to age categorization by WHO.<sup>19</sup> The relevant data collected includes the patients' socio-demographic information, clinical presentation, past medical history, previous anaesthetic and surgical treatments and complications along with outcomes, and follow-up.

Statistical Analysis: Descriptive statistics of mean, standard deviation, frequency, and percentage were used to summarize data. Data were analyzed using the statistical package for social sciences (SPSS) IBM version 25 and presented in tables.

#### RESULTS

The age distributions of the patients and their gender are presented in Table 1. The age group between 2 years and 12 years had the highest population. The table also shows urban/rural distribution.

Variable	Frequency	Percentage (%)
Age :		
Birth to $< 1$ month (neonates)	0	0
1 month – 2 years (Infants)	21	27.3
>2 years - 12 years (Children)	51	66.2
>12 years - 18 years (adolescent)	5	6.5
Gender :		
Male	71	92.2
Female	6	7.8
<b>Residence of Patients</b>		
Urban	12	15.6
Rural	65	84.4
Educational level		
Nil	26	33. 8
Primary Education	46	59.7
Secondary Education	5	6.5
Tertiary Education	0	0

 Table 1: Socio-demographic characteristics of patients involved in the study

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Table 2 shows the perioperative findings; the diagnoses, anaesthesia administered, intraoperative medications, procedures done and post-operative events.

Table 2: Perioperative findings

Diagnoses (N= 77)	Frequency	Percentage
Right inguinal hernia	42	54.5
Left inguinal hernia	31	40.3
Bilateral inguinal hernia	3	3.9
Umbilical hernia	1	1.3
Types of Anaesthesia (N=77)		
Local	5	6.5
Caudal block	15	19.5
General	57	74.0
Anaesthetic agent used (N=77)		
Ketamine	37	48.0
Ketamiine + Halothane	6	7.8
Ketamiine + Isoflurane	1	1.3
Marcaine + Ketamine	13	16.9
Marcaine	12	15.6
Xylocaine + Adrenaline	8	10.4
Intraoperative Medications (N=77)		
Prophylactic antibiotics	77	100
Analgesia	77	100
Procedure (N=80)		
Herniotomy	75	93.7
Herniorrhaphy	5	6.3
Transfusion (N=77)		
Yes	0	0
No	77	100
Admissions (N=77)	60	
Daycase	60	77.9
In-patient	17	22.1
Complications (N=77)		
Haematoma	3	3.9
Scrotal Oedema	3	3.9
Wound infection	1	1.3

The mean blood loss was 14.0mls $\pm 10.4$ mls and the method of assessment is subjective using the extent to which the gauze is soaked with blood and the number of soaked gauzes used by the surgeon per patient. The mean duration of the surgery performed at the surgical mission/outreach was  $34.9\pm 17.6$  minutes.

#### DISCUSSION

In this study, we transported identified patients that needed the specialized service to the tertiary institution where the professional services were offered to them. This is a shift from the traditional outreach programs where the care is carried to the beneficiaries in their locality.

From the results of the study, the male to female ratio is 12:1. This exceeds the most popular documented ratio of 5:1 to 9: 1 but still shows known marked male preponderance. <sup>3-5,11,20</sup> This wider disparity in the ratio of this study could be because this particular study was limited to only pediatric patients, unlike other studies that accounted for all the age groups.

The age group 2-12 years had the highest number of patients of 51, representing 66.23% of the study population. In this age group, there are no external factors that could be said to be responsible for the development of a hernia. Although there was no express documentation that the hernia in this group is congenital, there seems to be nothing else to be held responsible for their development of hernia other than congenital factors. This is in line with the works of Ibrahim et al,<sup>16</sup> which documented that inguinal hernia and hydrocele are among the most frequent congenital pathologies in the paediatric population.

The majority (about 84.2%) of the patients dwell in rural areas where there is limited access to healthcare which causes late or no presentation to hospitals. They were the target group. Ibrahim *et al*, <sup>4</sup> posited that out of eight African countries (Nigeria inclusive) studied for the spread of paediatric surgeons, there was none in the

rural areas. Thus, poor access to specialized healthcare and inadequate privately-funded health care financing in rural areas,<sup>5</sup> heightened our choice of patients and hospital.

The study showed more (56.3%){45 out of 80} right inguinal hernias. Van wessem *et al*,<sup>12</sup> opined that the development of hernia especially indirect hernia is caused by patent processus vaginalis (PPV). In their work, it was observed that there was a higher incidence of PPV on the right. They postulated that the reason for this right dominated PPV could be because during fetal life, the descent of the testes down into the scrotum guided by the processus vaginalis is finished on the left side before the right. It is only after the descent of the testes into the scrotum, does the processus vaginalis get obliterated; but for some yet to be established reasons, the processsus vaginalis on some occasions remains open after the descent of the testis predisposing to congenital hydroceles and hernia. The distribution between Right inguinal, left inguinal and bilateral hernias is akin to JT Momoh's finding in external hernia in children in northern Nigeria.<sup>21</sup> This may be explained by similar study population and area even though his study design is different.

In the course of the surgery, general anaesthesia was employed the most 57(74.0%) followed by caudal block and local anaesthesia 15 (19.5%) and 5 (6.5%) respectively. There was no major complication witnessed following any of the modes of anaesthesia. Local anesthesia was used among the older patients whereas general anaesthesia and caudal block were used among the younger patients. The safety with general anaesthesia can be ascribed to the advancement in anaesthetic care in children even in those with an unstable respiratory mechanisms.<sup>22</sup> This safety is guaranteed by the presence of qualified physician anaesthetists with full compliments of anaesthetic care in the tertiary center. This is not usually available in rural outstations.

Ketamine was the major anaesthetic agent of choice that was administered during the surgery, followed by a combination with plain marcaine although the percentage usage was far below that of ketamine alone. The choice of Ketamine is based on its availability, cost-effectiveness, and uniqueness with the ability to provide a wide spectrum of pharmacological effects including sedation, catalepsy, somatic analgesia, bronchodilatation, and neuroprotection e.t.c.<sup>23,24</sup>

Prophylactic antibiotics were used in all surgical procedures. Although Hernia repair is a clean surgery, it was necessary to use prophylactic antibiotics because the surgery was intended to be a day case that will be discharged after the surgery to their homes where good wound care and aseptic precautions cannot be guaranteed. Although there is great concern about the rise in antibiotic resistance, the use of prophylactic antibiotics is still recommended because it is generally effective for preventing postoperative wound infection.<sup>25,26</sup> The cost was not of great concern because a shot of ceftriaxone used was valued at approximately one dollar which was conveniently provided by the sponsor of the surgical outreach.

Intraoperative analgesia was used in all the patients. A survey in Australia and New Zealand among Anaesthetists recorded 70% compliance to intraoperative analgesia.<sup>27</sup> It ensures smooth anaesthesia and gives good immediate postoperative analgesia.

The study result shows that most of the procedures were herniotomy while a few were herniorrhaphy. The herniorrhaphies were done on the adolescent age groups while the herniotomy was performed on the infants and children. This is in line with the international best practice and agrees with the works of van wessem *et al.*<sup>12</sup> One of the herniorrhaphies was Mayo's repair for Umbilical hernia, while the other four adolescents had Moloney darn technique with Nylon 0.

Hernial sac dissection and high ligation was the primary procedure in the herniotomy. Narrowing of the deep ring with Vicryl 2/0 was employed as complimentary in few children with wide neck. A

complete dissection of the sac was done in most of the cases. This method was largely adopted because it is the method taught and largely performed in the institution. This is believed to be one of the most widely accepted and efficient methods of herniotomy; it is economical and has a great outcome with a low recurrence rate. <sup>8</sup>

The surgeries were completed at an average time of thirty-four minutes. There was an average blood loss of fourteen milliliters with no indication for blood transfusion. The majority of the cases were managed as day-case surgery. This could be because of measures that were taken to ensure minimal blood loss and good anaesthetic care. This high level of competency may be translated to the quality of personnel involved in the surgical outreach who were consultant surgeons and senior specialist trainees (Senior registrars). The involvement of the senior specialist trainees also implies high-level hands-on training opportunities the surgical outreach offered them.

About 22.1% of patients were admitted after the surgeries but were discharged within twenty-four hours of admission because the reasons (haematoma and scrotal swellings) for their admission were confirmed non-progressing. Late surgery time was also a significant reason for admission to ensure full recovery from anaesthesia and safe transport back to their homes.

#### CONCLUSION

Tertiary centers have adequate manpower and equipment to support many hernia surgeries among children in a low resource setting with good outcomes. This means that good standard practices can be maintained even in surgical outreach programs. Surgical outreach using tertiary hospitals can be said to be proficient, safe, and highly achievable in a low resource setting. This will help to handle the teaming of unreached poor children with hernias. Surgical outreach in the tertiary hospital offered a high opportunity for hands-on to surgery specialist trainees.

Recommendation: We therefore, recommend surgical

outreaches for hernias repair in children in low resource settings. These outreaches should preferably be performed in a tertiary healthcare center when available.

**Limitations to the study**: This a single-center study. A multicenter study will have improved the number of patients and will have a wider coverage.

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