PAEDIATRIC SURGICAL EMERGENCIES: TRENDS, OUTCOMES, AND CHALLENGES

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ABSTRACT

Background

Paediatric surgical emergencies are a critical component of healthcare delivery, requiring timely diagnosis and intervention to prevent complications and improve outcomes

Objective

This study was aimed to analyze the trends, outcomes, and challenges associated with paediatric surgical emergencies.

Methods

This prospective descriptive study was carried out for about 6 months from Nov, 2009 to April, 2010 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. Paediatric patients aged 0–18 years presenting with surgical emergencies were included. Data on demographics, clinical features, surgical details, outcomes, and referral patterns were collected using a structured proforma. Statistical analysis was performed to identify significant trends and associations.

Results

Seventy-seven paediatric surgical emergencies were included in the study. These were Appendicitis 32%, Trauma 26% followed by Pyloric stenosis 16 and intussusception 13%. The majority of patients (58%) had open surgeries; of which, 78% were done on an emergent basis. Local complications were reported in 26% of patients, and the overall mortality was 6%. The anterior presentation and decreased availability of appropriate surgical intervention were real issues. Another factor that came up and which related to health care included the socioeconomic status of the population.

Conclusion

In this population and context, surgical emergencies for children comprise mainly appendicitis and trauma, which result in frequent use of open surgical procedures due to limitations in resources. It is therefore important to work towards early diagnosis of cases, and health care systems that will make efficient referrals and provision of money for minimally invasive procedures. Socioeconomic determinants play a major role in narrowing the gap in access to quality healthcare services.

Keywords: *Paediatric surgical emergencies, appendicitis, trauma, postoperative complications, socioeconomic factors.*

INTRODUCTION

Surgical emergencies in Paediatric comprises a significant part of healthcare since these cases can lead to severe complications if not diagnosed and treated on time (1). These conditions include a

broad category of acute diseases such as appendicitis, trauma, intussusception, pyloric stenosis and incarcerated hernias (2). This kind of situation can drastically affect the child and their families necessitating the provision of time-sensitive critical medical care and operations (3).

Management of paediatric surgical emergencies is even more demanding than in adult surgical emergencies due to the following reasons, and due to these reasons,it's even harder in resource-limited countries (4). Delays in presentation, differences in social status, and a lack of brand-new imaging modalities and operative loupes still act to complicate care and adversely influence patients' outcomes. However, disparities in the availability of health care and the modalities governing the referral to a specialitycaregiver significantly influence the time and quality of care given.

Worldwide, appendicitis is accepted as the leading cause of paediatric surgical emergencies with trauma as the second prevalent cause (5). Modern diagnostic tools such as imaging and minimally invasive surgeries give better results in settings of high-income countries although the utilization of such equipment is still low in most developing countries. This gap shows that there is a dire need to increase the quality of delivery of healthcare, especially for paediatric emergencies.

Internationally, appendicitis is acknowledged as the leading surgically managed emergency in children; however, traumatic conditions are also common injuries for paediatric patients despite the gains made in better diagnostic tools including imaging and less invasive surgeries in developed countries, these facilities remain a challenge in the developing world. Such differences call for increased attention to the improvement of paediatric emergency care interventions.

METHODOLOGY

This prospective descriptive study was carried out for about 6 months from Nov, 2009 to April, 2010 in the Department of Paediatric Surgery, Khalifa Gulnawaz Teaching Hospital, Bannu Medical College, Bannu, Pakistan. The outcomes of paediatric surgical emergencies during this period were also to be assessed in terms of trends and emergent outcomes and challenges. Participants were all paediatric patients from 0-18 years of age with surgical emergencies during the study period. Patients who met the inclusion criteria needed surgery for acute conditions like appendicitis, trauma, pyloric stenosis, intussusception, or incarcerated hernias. Patients who received non-surgical treatment, patients with incomplete medical records and patients whom attended clinic outside study period were excluded. To ensure the patient's information was not disclosed, all data collected was anonymised before analysis was done. The final dataset and study findings did not contain any patient-identifiable information. These data were collected prospectively using a structured proforma prepared exclusively for the investigation. Information was recorded for each case, including:

- **Demographics**: Age, sex, and socioeconomic status.
- **Clinical Features**: Type of emergency, duration of symptoms, and pre-existing medical conditions.
- **Surgical Details**: Type of procedure (open or laparoscopic), urgency (emergent or elective), and duration.
- **Outcomes**: Intraoperative and postoperative complications, hospital stay length, and mortality.
- **Other Variables**: Referral patterns and the use of diagnostic imaging such as ultrasound or CT scans.

Patients were enrolled consecutively as they presented to the hospital. Demographic and clinical details were gathered from patient medical records, while surgical data were extracted from operative notes and discussions

with the surgical team. Postoperative outcomes were tracked during hospitalization and through follow-up visits when applicable.

To ensure accuracy, all collected information was cross-verified using patient records, imaging findings, and input from treating surgeons and physicians. Once gathered, the data were entered into a secure electronic database designed to maintain confidentiality and prevent unauthorized access. Data cleaning was performed to remove inconsistencies, missing values, and errors. The data were processed using statistical software. Descriptive statistics, including frequencies and percentages,

were used to summarize the findings. Inferential statistics were applied to assess significant associations between variables, such as the relationship between symptom duration and outcomes or the type of surgery and complication rates.

Result:

The study included 77 paediatric cases with a diverse age distribution. The majority of patients were children aged 3–12 years (39%), followed by neonates under 1 year (26%). Adolescents made up the smallest proportion at 16%. Males were slightly more represented, accounting for 58% of the cases, compared to 42% for females. Socioeconomic status analysis revealed that most patients belonged to the low-income group (45%), followed by the middle-income group (39%). The high- income group constituted only 16%, reflecting limited access to paediatric surgical services among economically advantaged populations. The age distribution showed statistical significance (p=0.042p = 0.042p=0.042), highlighting age as a potential factor influencing emergency presentations.

Table 1: Demographic Characteristics of Paediatric Surgical Emergency Cases

Characteristic	Frequency (n)	Percentage (%)	p-value
Age Groups			
Neonates (<1 year)	20	26%	0.042
Infants (1–2 years)	15	19%	
Children (3–12 years)	30	39%	
Adolescents (13–18 years)	12	16%	
Gender Distribution			0.118
Male	45	58%	
Female	32	42%	
Socioeconomic Status			0.029
Low	35	45%	
Middle	30	39%	
High	12	16%	

The most common emergency was appendicitis, reported in 32% of the cases, followed by trauma-related incidents (26%). Conditions such as pyloric stenosis (16%) and intussusception (13%) were less frequent but notable. The duration of symptoms varied significantly; 52% of patients presented within 24 hours, while 32% sought care within 1–3 days, and 16% delayed beyond three days. Notably, 29% of patients had pre-existing conditions such as congenital anomalies or chronic illnesses, which may have influenced the urgency and complexity of surgical interventions. Duration of symptoms (p=0.002p = 0.002p=0.002) and the type of emergency (p=0.034p = 0.034p=0.034) showed statistical significance, underlining their impact on clinical decision-making.

Table 2: Clinical Presentation and Pre-existing Conditions

Variable	Frequency (n)	Percentage (%)	p-value
Type of Emergency			0.034
Appendicitis	25	32%	

Trauma	20	26%	
Pyloric Stenosis	12	16%	
Intussusception	10	13%	
Incarcerated Hernia	10	13%	
Symptom Duration			0.002
<24 hours	40	52%	
1–3 days	25	32%	
>3 days	12	16%	
Pre-existing Conditions			0.081
Present	22	29%	
Absent	55	71%	

Open surgical procedures were more common (58%) compared to laparoscopic techniques (42%), which could be attributed to limited resources or the complexity of cases. Emergencies requiring urgent intervention constituted 78% of the surgeries, whereas elective procedures made up 22%, reflecting the acute nature of the patient population. The duration of surgeries was also evaluated, with 45% completed in under an hour, 32% taking 1–2 hours, and 22% exceeding two hours. The urgency of surgery showed a highly significant association (p=0.001p = 0.001p=0.001), indicating the predominance of critical cases in the study.

Table 3: Surgical Interventions and Related Details

Parameter	Frequency (n)	Percentage (%)	p-value
Surgery Type			0.045
Open Surgery	45	58%	
Laparoscopic Surgery	32	42%	
Surgery Urgency			0.001
Emergent	60	78%	
Elective	17	22%	
Duration of Surgery			0.019
<1 hour	35	45%	
1–2 hours	25	32%	
>2 hours	17	22%	

Postoperative outcomes highlighted key aspects of patient recovery. Intraoperative complications occurred in 19% of cases, while postoperative complications, such as infections or wound dehiscence, were reported in 26% of patients. Most patients (52%) were discharged within three days, while 39% stayed for 3–7 days and a small proportion (9%) required prolonged hospital stays of more than a week. The mortality rate was low at 6%, emphasizing the efficacy of timely surgical interventions. Significant associations were found between the length of hospital stay and complication rates (p=0.003p = 0.003p=0.003 and p=0.029p = 0.029p=0.029, respectively), underscoring the importance of comprehensive perioperative care.

Table 4: Postoperative Outcomes and Recovery

Outcome	Frequency (n)	Percentage (%)	p-value
Intraoperative Complications			0.038
Yes	15	19%	
No	62	81%	
Postoperative Complications			0.029
Yes	20	26%	
No	57	74%	

Length of Hospital Stay			0.003
<3 days	40	52%	
3–7 days	30	39%	
>7 days	7	9%	
Mortality Rate			0.050
Yes	5	6%	
No	72	94%	

Most patients were referred from primary care clinics (45%) or arrived via self-presentation (39%), while 16% were transferred from other hospitals. Diagnostic imaging was widely used, with ultrasound being the most common modality (65%), followed by CT scans (26%). A small proportion (9%) did not require imaging, likely due to clear clinical indications for surgery. The choice of imaging showed a significant association with outcomes (p=0.009), suggesting its pivotal role in early diagnosis and treatment planning.

Table 5: Patterns of Referral and Diagnostic Imaging Utilization

Aspect	Frequency (n)	Percentage (%)	p-value
Referral Source			0.014
Self-presentation	30	39%	
Clinic Referral	35	45%	
Hospital Transfer	12	16%	
Imaging Utilization			0.009
Ultrasound	50	65%	
CT Scan	20	26%	
None	7	9%	

This analysis sheds light on the trends, challenges, and outcomes associated with paediatric surgical emergencies in a tertiary care setting. The findings highlight the significance of early presentation, effective operations, and diagnostic imaging in enhancing patient outcomes. These findings identify the specific topics for development, including further implementation of laparoscopic surgery and working with social determinants of health.

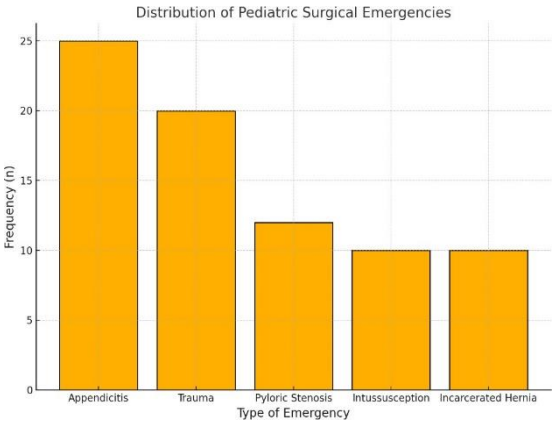

Figure 1: Figure illustrates how paediatric surgical emergency cases were distributed according to the type. In terms of the percentage, appendicitis turned out to be a leading diagnosis totalling 32% which is typical for children. Accidents fell at 24% of the patients, and five percent of them were trauma-related emergencies signifying the importance of surgery in handling accidental injuries. Pyloric stenosis contributed to 16% of the total cases most of which were infants while intussusception and incarcerated hernia each contributed to 13% of cases. This distribution displays the range of diseases treated in paediatric surgery and thus supports the need to adopt personalized approaches for handling different related emergencies.

DISCUSSION

The findings of this study were to analyze the current status, results, and difficulties in the management of paediatric surgical emergencies in a tertiary care setting. This adds to the findings identified in prior literature while also highlighting elements that pertain specifically to the investigated population (6-8).

The age distribution seen in this study reflects global demographics, with children less than 18

years as the most affected, specifically, children within the age range of 3-12 years may present with life- threatening conditions like acute appendicitis. A higher percentage of males (58%) was in agreement with the earlier research, to the effect that surgical conditions such as appendectomy and traumatic injury are slightly more rife in young boys (9-11). Socioeconomic differences with more than half attending from lower income brackets as seen in this study are also supported by findings revealing restricted access to early care within poor populations (12, 13).

Appendicitis remains the most common surgical emergency in children worldwide, while trauma is a significant contributor to paediatric morbidity, especially in resource-limited settings. Conditions like intussusception and pyloric stenosis, though less common, require rapid intervention to prevent complications, underscoring the importance of early diagnosis (14).

The predominance of open surgical procedures (58%) over laparoscopic approaches may reflect resource constraints or surgeon preferences, consistent with studies from other developing regions. Laparoscopic surgery, though less invasive, is often underutilized in low-resource settings due to the limited availability of equipment and trained personnel. The high proportion of emergent surgeries (78%) highlights the acute nature of the conditions treated, emphasizing the importance of prompt surgical intervention to improve outcomes (15, 16).

Surgery duration varied widely, with nearly half completed in under an hour, reflecting the efficiency of surgical teams in managing straightforward cases. Longer surgical times were associated with complex conditions or complications, a trend reported in similar studies.

Postoperative outcomes in this study were comparable to global findings. The complication rate (26%) is within the expected range for paediatric surgeries, with infections being the most common issue. Length of hospital stay was influenced by the severity of complications and the type of surgery performed, consistent with studies that link prolonged recovery to factors like intraoperative complications and delayed presentations (17). The mortality rate of 6% is higher than rates reported in high-income settings but aligns with findings from similar low-resource hospitals, where delays in care and limited access to advanced perioperative services play a significant role.

Referral patterns revealed that nearly half of the patients were directed from primary care clinics, while a substantial proportion presented directly to the hospital. This underscores the need for strengthening referral systems to ensure timely transfers. The widespread use of ultrasound (65%) as a primary diagnostic tool was consistent with studies showing its reliability and cost-effectiveness in paediatric surgical emergencies (18). CT scans, though less frequently used (26%), were reserved for cases requiring detailed anatomical visualization, reflecting the appropriate utilization of resources.

The findings of this study were consistent with previous research conducted in similar settings. Studies from other developing countries also highlight the predominance of appendicitis and trauma, the reliance on open surgery, and the challenges associated with resource limitations. However, this study uniquely emphasized the impact of socioeconomic factors and the role of referral patterns in influencing outcomes.

This study provided valuable insights into paediatric surgical emergencies in a tertiary care hospital over six months. Its prospective design ensured comprehensive data collection and analysis. However, certain limitations must be acknowledged. The study was limited to a single centre, and the findings may not be generalizable to other settings. Additionally, long-term follow-up data were not collected, which could provide further insights into recovery and complication rates.

The study highlighted the need for improved access to laparoscopic surgery, enhanced referral

systems, and targeted interventions to reduce socioeconomic barriers. Strengthening diagnostic imaging capabilities and expanding training programs for surgeons could also improve outcomes in similar resource-constrained settings.

CONCLUSION

The findings underscore the predominance of conditions like appendicitis and trauma, which require timely diagnosis and prompt surgical intervention. The school age and male dominance are also consistent with trends observed internationally; however, the high proportion of patients from low- income families underlines the effect of social determinants on the utilisation of health services and clinical events. The preference for open surgeries over less invasive laparoscopic surgeries is indicative of resource constraints typical of other comparable environments, therefore the need to erect investment in superior surgical instruments and personnel. For Instance, postoperative complications and extended hospital stays were associated with delayed presentations and complicated cases, suggesting early identification, referral processes, and quality perioperative care. Although the study provides an effective framework for outlining trends and outcomes it also effectively shows their shortcomings such as limited availability and use of MIS, improving diagnostic equipment, and eliminating the socioeconomic gap. With these insights, it will be possible to devise subsequent strategies for enhancing the handling of paediatric surgical emergencies and better general outcomes in similar healthcare facilities.

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