JIMMA UNIVERSITY

INSTITUTE OF HEALTH FACULTY OF MEDICAL SCIENCE

DEPARTMENT OF ANESTHESIOLOGY

PATTERN OF EMERGENCY PEDIATRIC SURGERIES AT JIMMA UNIVERSITY MEDICAL CENTER, JIMMA, ETHIOPIA: A TWO-YEAR RETROSPECTIVE CROSS SECTIONAL STUDY

BY: KEDIR HUSSEIN (MD, ANESTHESIOLOGY RESIDENT)

A RESEARCH PAPER TO BE SUBMITTED TO DEPARTMENT OF ANESTHESIOLOGY, JIMMA UNIVERSITY DEPARTMENT OF ANESTHESIOLOGY CRITICAL CARE AND PAIN MEDICINE, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE SPECIALTY CERTIFICATE IN ANESTHESIOLOGY

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BY: KEDIR HUSSEIN (MD, ANESTHIOLOGY RESIDENT)

ADVISORS:

DR. TESHOME ASSEFA (MD, ASSISTANT PROFESSOR OF ANESTHESIOLOGY, CRITICAL CARE AND PAIN MEDICINE)

DR. EDOSA KEJELA (MD, ASSISTANT PROFESSOR OF ANESTHESIOLOGY, CRITICAL CARE AND PAIN MEDICINE)

JIMMA TOWN, ETHIOPIA

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Abstract

Background: Pediatric surgical emergency condition is a broad spectrum of surgical pathologies/disorders occurring in pediatric age group requiring proper emergency surgical care as the only option of management to salvage life, avoid/minimize disability or palliation. Children have unique surgical conditions, anesthetic challenges, and special preoperative requirements. Pediatric surgical conditions can have long-term consequences because they affect children at critical stages of growth and development. Surgical diseases in children are as common in developing countries as they are in developed countries. The most common surgical problems that affect African children are injuries, congenital anomalies, and surgical infections, all of which pose a serious health risk.

Objectives: The main objective of this study is to analyze the patterns of emergency pediatric surgeries done at Jimma University Medical Center.

Methods: A two-year Institutional based retrospective study was conducted at Jimma university medical center from July 2019 to July 2021. Information concerning socio-demographic and background variables was collected by record review of operation theatre log book and Anesthesiology department log books by using a structured questionnaire. The data obtained was edited, coded, entered, and cleaned by Epidata version 4.6 by the principal investigator. Statistical Package for the Social Sciences (SPSS) version 26 was used for analysis.

Result: A total of 1282 surgical cases were analyzed in the study. The median age (months) was 68, majority of the patients were males 872 (68.0%), M: F =2.1:1. The most common diagnoses which required surgical intervention were soft tissue surgical infections 350(27.9%), gastrointestinal problems 319 (24.9%) and Foreign bodies 157(12.2%). Majority of the patients 712 (55.5%) were operated under general anesthesia.

Conclusion and recommendations: The finding of the study in Jimma university medical center showed that the commonest emergency surgical problem in children was soft tissue infections, which can be reduced by taking preventive measures involving the policy makers and the community health education.

Key words: pediatric surgery, emergency, patterns, Jimma university medical center, Ethiopia

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Abbreviations and Acronyms

ARM – Anorectal Malformation

COSECSA - College of Surgeons of East, Central, and Southern Africa

HSD – Hirschsprung disease

ICU – intensive care unit

IHPS – infantile hypertrophic pyloric stenosis

JUMC – Jimma university medical center

LMICs - low- and middle-income countries

MIO - Mechanical intestinal obstruction

NICU – neonatal intensive care unit

PSAE - Pediatric surgical abdominal emergencies

PSs - pediatric surgeons

SPSS - Statistical Package for the Social Sciences

SSA - Sub-Saharan Africa

TIP - Typhoid ileal perforation

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1. Introduction

1.1. Background information

Global surgical care has not progressed in a consistent manner around the world. For many years, surgical care has been conspicuously absent from national and global health plans in low- and middle-income countries (LMICs), resulting in increasing mortality and morbidity from common curable surgical illnesses. Untreated surgical problems have become a significant part of the global disease burden in resource-poor countries (1).

Africa has the world's highest unmet surgical needs for a variety of reasons (2). Children make up half of Africa's population (3). As a result, a significant portion of health-care resources and efforts have been directed toward the prevention and treatment of pediatric surgical diseases. However, it is estimated that by the age of 15, 85 percent of African children will require surgical treatment (4,5). Given Africa's projected population growth to 2 billion by 2050, pediatric surgical interventions will be in high demand, some of which can only be performed in pediatric surgical subspecialty centers. Despite the high demand for these procedures, Africa has a severe shortage of pediatric surgeons (PSs), surgical facilities, and high-quality surgical care. To meet current and future surgical demands, immediate investment in human and physical surgical resources is required (6).

Children have unique surgical conditions, anesthetic challenges, and special preoperative requirements. Pediatric surgical conditions can have long-term consequences because they affect children at critical stages of growth and development. Surgical diseases in children are as common in developing countries as they are in developed countries. The most common surgical problems that affect African children are injuries, congenital anomalies, and surgical infections, all of which pose a serious health risk (7,8).

According to available information, Sub-Saharan Africa (SSA) has the world's biggest unmet surgical need, with 41 million cases per year accounting for 29 percent of the global unmet need. Congenital abnormalities are responsible for 9% of the global surgical burden of disease. Each year, an estimated 2.6 million children in SSA are born with a congenital abnormality (9). The most prevalent surgical disorders in children in Sub-Saharan Africa are congenital defects and infection (10). In African children aged 4 to 45 years, injury is the main cause of illness and mortality (4). Inguinal hernias, genitourinary abnormalities, anorectal malformations, myelomeningoceles, and cleft lip and palate are among the most frequent congenital anomalies (6).

Typhoid intestinal perforation, appendicitis, primary peritonitis, pyomyositis, necrotizing fasciitis, and osteomyelitis are all common illnesses that require surgical intervention (11). Improved clinical and nutritional management of pediatric surgery patients has improved survival in high-income countries. Clear health policies that support and welcome surgical training and improvements in surgical infrastructure are needed in low and middle-income nations (12).

1.2. Statement of the problem

Data from around the world demonstrates that there is a previously unacknowledged, significant amount of surgery demand. Surgical complications have become a public health concern around the world (13). In 2010, 16.9 million people died as a result of untreated surgical complications (14). With proper surgical care and anesthetic, about half of the issues can be prevented. However, 5 billion people lack access to appropriate surgical care and anesthesia when they are required. The situation is most acute in Sub-Saharan Africa, where 94 percent of the population lacks access to safe and affordable surgery (2).

Pediatric surgery is in high demand in this corner of the world, where children make up half of the population. Furthermore, a large number of these children (2.6 million every year) are born with a congenital defect. According to studies, up to one-third of all childhood deaths are caused by surgical complications (15).

The College of Surgeons of East, Central, and Southern Africa (COSECSA) is a 12-country organization. There are now just 0.53 surgeons per 100,000 people in this region, and the majority of these surgeons (85%) serve only 15% of the urban population. In contrast, rich countries such as the United States have 54.7 surgeons per 100,000 people. In this section of Africa, there is an even more worrying scarcity of pediatric surgeons. There are now just 52 pediatric surgeons in the area, resulting in a ratio of 1 per 7,000,000 people (16).

Africa is home to less than a fifth of the world's population, but it bears a quarter of the world's disease burden. In the world, children under the age of 15 make up 26% of the population; in Sub-Saharan Africa, they make up 43% of the population. Furthermore, several African countries' populations are expected to double by 2050, with Africa's youth accounting for 35 percent of the global youth population (17). Surgical problems account for 6–12% of all pediatric visits and are responsible for up to a third of all childhood deaths (18).

As a result, surgical complications play a considerable role in the overall burden of pediatric disease in low- and middle-income countries. Butler's group study has determined that there is a substantial burden of

unmet surgical need, with nearly 20% of children requiring surgery and 62 percent of those children having at least one unmet surgical need, based on population data from four LMICs (19).

Due to the particular surgical situations, distinct anesthetic issues, and unique perioperative needs, pediatric surgical treatment is often regarded as an expensive specialist. Furthermore, the care of these youngsters may be ongoing throughout their lives, necessitating frequent follow-ups until they reach adulthood. With an estimated 312.9 million operations in 2012, there is a substantial volume of operative procedures worldwide (20). Differences in illness patterns and pediatric surgical care practice exist between developing and developed countries due to socioeconomic situations in resource-constrained LMICs (4). Despite the apparent severity of pediatric surgical disorders in underdeveloped nations, epidemiological data is limited, making it difficult to determine the true surgical burden of the pediatric population (21).

Worldwide, an estimated 93 million children live with some form of moderate or severe disability(22). Congenital diseases, which affect 7% of all births globally, are among the top 10 major causes of pediatric morbidity and mortality (23). Congenital abnormalities have a particularly high impact on children, families, and health systems in low- and middle-income countries (LMICs), which have a disproportionate incidence of these serious birth disorders (94 percent) (24,25). Children who survive infancy with these congenital defects generally live with disabilities and suffer major physiological and psychological consequences, including community stigma and prejudice (26). Many congenital defects can result in death or incapacity if surgical intervention is not performed in a timely manner. Lack of access to surgically trained healthcare practitioners, operating room facilities, and surgical supplies are only a few of the issues that make it difficult to offer proper surgical care for these illnesses in LMICs (27). Despite recent economic analyses demonstrating that surgery is a more cost-effective means of reducing disease burden than many other medical interventions (28), and recognition that surgical care is one of the top eight interventions critical to the progression of welfare among the world's poorest populations, access to surgical care remains limited (29).

Pediatric surgical treatment necessitates different infrastructure, personnel, and resources than adult surgical care (30). Many aspects of pediatric surgical care are cost-effective, and under the right circumstances, they can shield families in need from medical poverty (31). According to available statistics, LMICs have a high burden of pediatric surgical conditions, with estimates ranging from 10% to 85% of children in Sub-Saharan Africa having a surgical condition (32). Due to a shortage of high-quality data, reliance on small cohort studies, use of institutional-based surveys (which do not capture out-of-hospital disease), and an emphasis on urban locations, reliable estimates on the burden of surgical diseases among

children remain limited (18). Children's surgical conditions have been largely ignored in recent national health evaluations, making it difficult to design inclusive, effective health-care policy (33). Although some recent studies have approximated the prevalence of surgical conditions in LMICs, the majority of extant studies do not focus on pediatric conditions, and just a handful analyze surgical conditions across a country (34,35).

Elective surgery or the same pathology in adults do not require the same level of surgical and perioperative supportive care as emergency surgical conditions/diseases in children. These delicate qualities of the diseases, along with a disproportionately higher load of patients in tertiary hospitals in underdeveloped countries like Ethiopia, where common general surgery cases are hardly or not at all addressed at district hospitals, further jeopardizes service delivery. In addition to a lack of human resources, bad infrastructure has a negative influence on service delivery. As a result, mortality and morbidity are exponentially higher in low-income countries than in high-income countries.

In our study area in Jimma University Medical Center is one of the oldest hospitals in Ethiopia and it is the only teaching and referral hospital in southwest Ethiopia with 800 bed capacity and a catchment population of over 15 million people. There are 2 pediatric surgeons and 5 Anesthesiologists in the hospital.

1.3. Significance of the study

Pediatric surgical emergency conditions encompass a wide range of surgical pathologies/disorders that affect children of all ages and necessitate immediate surgical intervention to save lives, avoid/minimize impairment, or provide palliation.

All situations, including common general surgical emergencies that could have been handled at general hospitals, must be handled by the JUMC. As a result, it's critical to have up-to-date information on the prevalence, nature, and types of common surgical emergencies at JUMC. This could be the initial step in developing care-improvement measures and. It can also serve as a basis for subsequent research at various levels. As a result, a study in this field is required at our institution to close the information gap, notably on current surgical crises in pediatrics.

The study also necessary to show directions of potential expansion of pediatric surgical care and to direct attentions for different surgical units in the Hospital.
The study could also serve as a basis for further investigations.

2. Literature review

Traumatic damage was the most common reason for admission in all age categories except neonates, who had congenital abnormalities as the most common reason for admission, according to a study conducted in Lilongwe, Malawi. Only 35% of patients (n=392) underwent surgery, indicating that the majority of patients were handled non-operatively. 87 (22%) of the 392 patients who had surgery were operated on urgently. Thirty-four (23%) trauma cases, 23 (24%) congenital cases, seven (10%) infectious cases, and twenty-three (66%) acute abdominal cases necessitated emergency surgery.

According to a study conducted in southwestern Uganda, 5571 procedures were performed on children aged 14 years; the annual overall surgical rate for children aged 14 years was 180 per 100,000 population. Trauma and burns (30.2 %), general or urologic pediatric surgery (25 %), and infection (drainage of abscess/osteomyelitis) were the three most common diagnostic surgical categories in Ugandan children (14.9%). About 112 (80%) of the 140 cleft lip and palate procedures were successful (37).

According to a study conducted in the North Central Nigerian Centre, around 78 percent of children were admitted to the emergency pediatric unit, 7% to the newborn intensive care unit, 5% to the inpatient ward, 7% to the accident and emergency room, and 3% were outpatients. The average age was 4.6 0.47 years, with a 2.5:1 male-to-female ratio. Mechanical intestinal obstruction (MIOB) was the most prevalent cause of Pediatric surgical abdominal emergencies (PSAEs) and was most commonly seen in early infancy, whereas peritonitis was the second most common cause of PSAEs, primarily in late childhood (7–12 years). At a mean age of 10.6 years, acute appendicitis struck 15% of cases, with a male-to-female ratio of 1.1:1. Typhoid ileal perforation (TIP) was responsible for 22% of the cases, which occurred between the ages of 2 and 12, with a mean age of 7.7 1.19 years (38).

According to a study conducted at Yirgalem Hospital in Southern Ethiopia, emergency cases accounted for 98.13 percent of all cases, while the rest were planned or elective. The most common reason for admission was intussusceptions, which accounted for 19 (14.1%) of the cases. The children's ages ranged from 10 to 9, with 14 of them being under the age of six months. Another prevalent finding is anorectal deformity in 7 children; early neonates with imperforate anus are also recorded in this group; males predominate 1.3:1, with a range of age of 1 month. Trauma of the limbs was the next most common surgical condition in this sample, with 18 (13.4 percent) males outnumbering females by a ratio of 2.6:1, with an age range of 6 months (39).

According to a study conducted at Adama Hospital Medical College, 82 percent of admissions were made on an emergency basis. GI disorders (33.8 percent, N=130), trauma (25.5 percent, N=98), and congenital

malformations (19 percent, N=73) were the most common reasons for surgical admissions. Appendicitis (54 percent, N=70) and intestinal obstruction (30 percent, N=39) were the most prevalent gastrointestinal diagnosis. The most common causes of burn injury (85%) were scald and flame burns. All fractures are caused by falls and motor accidents, which account for 88 percent of all fractures. Inguinal hernia (38.4%) and undescended tests were the most prevalent congenital defects (16.4 percent). Any space-occupying abscesses (47 percent) and osteomyelitis (25 percent) were the most prevalent surgical site infections (40).

According to a study conducted in an Ethiopian tertiary hospital, the bulk of the patients, 328 (72.2%), were between the ages of 3 and 5, with 76 (16.7%) being 5 years or older and 50 (11.1%) being under the age of 3. With a male-to-female ratio of 2:1, 302 (66.5 percent) were males and 152 (33.5 percent) were girls. The patients' precise diagnoses revealed that 12.8 percent of them had appendicitis, 13.9 percent had intussusception, and 8.8 percent had IHPS. The following congenital defects cause intestinal obstruction: ARM 1.5 percent, anal stenosis 0.9 percent, HSD 3.3 percent, and Incarcerated inguinal hernia 1.1 percent. Testicular torsion accounts for 1.1 percent of urogenital emergencies, while post circumcision complications account for 0.66 percent, Hypospadias with meatal stenosis accounts for 0.9 percent, Obstructive uropathy secondary to PUV accounts for 2%, Bladder outlet obstruction secondary to bladder stone accounts for 0.9 percent, Abscess collection accounts for 4.8 percent, and Trauma/injury accounts for 5.3 percent (41).

According to a study conducted at Tikur Anbessa Specialized Hospital, there were 4,538 pediatric patients admitted and surgical procedures performed throughout the study period. They were 12 hours to 13 years old, with a median (IQR) age of 48 (12-96) months. 734 (16.2%) were neonates, 808 (17.8%) were babies, 1741 (38.4%) were children one to five years old, and 1,255 were children above the age of five years (27.7 percent). The ratio of males to females was 2.2 to 1. Emergency cases accounted for 2,737 (60.3%) of all cases, while elective cases accounted for 1801 (39.7%). The most common reason for admission and operation was congenital abnormalities, which accounted for 2158 (47.6%), followed by trauma (970). (21.4 percent). Inflammatory conditions accounted for 639 (14.0%), infectious 264 (5.8%), tumor 213 (4.7%), and other surgical conditions accounted for 294 (4.7%). (6.5 percent). The gastrointestinal (GI) system was the most often impacted system, affecting 2,121 (46.73 percent) of patients. In 878 (19.34%) of the patients, the urinary system was implicated. It was followed by the respiratory system, which received 448 (9.87%) votes, and the musculoskeletal system, which received 306 votes (6.79 percent). In our study, anorectal malformation was the most common congenital abnormality. It was responsible for 19 percent of gastrointestinal surgical admissions and 8.8% of general pediatrics surgical admissions. The second most common cause of GI was Hirschsprung disease, which accounted for 296 (13.9 percent) of GI admissions

and procedures. The two most common acquired emergency abdominal illnesses needing admission and intervention were appendicitis 316 (14.9%) and intussusception 187 (8.8%). Foreign body aspiration accounted for 7.9% of all surgical admissions, while ingested foreign bodies accounted for 10% of all admissions. Hypospadias was the most common urological ailment requiring hospitalization and surgical procedures, with 201 instances. It accounted for 4.4 percent of all surgical hospitalizations in pediatrics. Undescended testis (2.7 percent) and congenital obstructive posterior urethral membrane (COPUM) (2.5 percent) came in second and third, respectively (42).

According to a study conducted at Tikur Anbessa University Teaching Hospital, gastrointestinal lesions accounted for nearly half (43.3 percent) of all neonatal surgical disorders seen in the study group. Abdominal wall defects (15.5%), esophageal atresia with or without fistula (12.6%), craniospinal defects (11.8%), head and neck malformations (4.6%), musculoskeletal conditions (3.7%), surgical infections (2.6%), genitourinary diagnosis (1.8%), and other clinical conditions were among the other cases (4.1 percent). The bulk of the cases had congenital diagnoses (86.2%) (n=562), with the remainder 13.8 percent (n=90) having acquired surgical disorders. Idiopathic Hypertrophic Pyloric Stenosis, Necrotizing enterocolitis, intussusception, and spontaneous jejunal perforation were described cases in the gastrointestinal system among the acquired surgical diseases. Testicular torsion, post-circumcision hemorrhage, and post-circumcision urethral damage have all been identified in the genitourinary system. Iatrogenic long bone fractures, clavicular fractures, and shoulder dislocation experienced during delivery were among the musculoskeletal disorders acquired. Surgical infections (septic joint, Pyomyositis, necrotizing fasciitis, scrotal abscess), incarcerated inguinal hernia, pneumothorax, and primary peritonitis were among the other acquired surgical diseases (43).

3. Objectives

3.1. General and Specific Objectives

- To analyze the pattern of emergency pediatric surgical procedures done at Jimma University Medical Center in a period of 2 years from July 2019 to July 2021.
- To describe the types of Anesthesia used for emergency pediatric cases

4. Methods and materials

4.1. Study area and period

The study was conducted in Ethiopia, Oromia regional state, Jimma town at Jimma university medical center, which located 352 km southwest of the capital Addis Ababa. JUMC is one of the oldest hospitals in Ethiopia and it is the only teaching and referral hospitals in southwest Ethiopia with 800 bed capacity and a catchment population of over 15 million. It serves about 160,000 patients per year in its outpatient department and about 15,000 in the inpatient and 11,000 in the emergency departments. This study was undertaken from October 1 to November 30, 2021.

4.2. **Study design -** A retrospective Cross-sectional descriptive design was used.

4.3. Population

4.3.1. Source population

All pediatric surgical Procedures undergone in a period of 2 years from July 2019 to July 2021.

4.3.2. Study population

The study population included all Pediatric Emergency Surgical Procedures underdone in a period of 2 years from July 2019 to July 2021.

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

All patients' under 15 years managed for emergency surgical diseases at Jimma university medical center was included in the study.

4.4.2. Exclusion criteria

Pediatric emergency surgical cases who needed Ophthalmologic intervention because data was difficult to avail.

4.5. Sample size and sampling technique

No sample size will be determined as all source population was included as the study subjects provided that the documents are complete for the variables of interest.

4.6. Study Variables

- Age
- Sex
- Admitting surgical unit
- Diagnosis of the patient
- Type of anesthesia used

4.7. Data collection tool and procedure

Information concerning socio-demographic and background variables was collected by record review of registration books in the operation theatre and the department of anesthesiology, critical care and pain medicine using a structured questionnaire that was developed by the principal investigator based on relevant literature review and consultation with the advisor. Trained data collectors was used to collect the data.

4.8. Data entry, processing and analysis

After data collection and checking of the content of the data obtained was edited, coded, entered, and cleaned by Epidata version 4.6 by the principal investigator. SPSS version 25 was used for analysis and Statistical significance test was applied to see the association between pattern of emergency pediatric surgery and predictor variables. Descriptive data was presented as counts and percentages for categorical data. For continuous variables will be presented as Means, Medians and Standard deviations.

4.9. Data quality control

The investigator pretested the questionnaires three days before the beginning of fieldwork to ensure that the questions are clear and understandable to data collectors and respondents. A thirty-minute briefing between the main investigator and data collectors was held each day before data collection begins to guarantee completeness, accuracy, and consistency. Before using the surveys, these sessions was thoroughly checked. On-site technical help and careful monitoring are also available from the principal investigator. The principal investigator was modify the data on a daily basis to ensure that the data are accurate, consistent, ambiguous, and comprehensive. Before analyzing the data, the investigator was enter and clean it.

4.10. Operational Definition

- **Types of surgery:** It is a kind of surgical procedures performed for patients who presented with pediatric emergency surgical diseases and conditions.
- **Patterns of surgery:** It is the frequency and repetitiveness of the surgical cases and surgical procedures performed for the cases.
- **Trends of surgery:** It is frequency distributions of pediatric emergency surgical procedures performed over a defined time period, usually annually, of similar duration at different time.

4.11. Ethical considerations

Prior to the start of the research, the principal investigator will obtain ethical approval from the institutional ethical review board of Jimma University. All data obtained in the course of the study will be kept confidentially and be used solely for the purpose of the research. The name of respondents will never be used by any means throughout the research and participants will be told they have the right to withdraw themselves from study anytime they want.

4.12. Dissemination plan

The research will be presented for partial fulfillment of specialty certificate in anesthesiology, critical care and pain medicine. The Soft copy and hard copy of finding of this research will be disseminated kindly to the department of anesthesiology, critical care and pain medicine and for selected department of the hospital. Finally the result of the study will be disseminated to the scientific community through seminars, workshops, and conferences of health professionals association and publications in peer-reviewed scientific journals.

5. Results

5.1. Socio-demographic Characteristics

A total of 1282 cases of pediatric surgical emergency cases reviewed from operation theatre registration books and anesthesiology department log book during the two-year study period. Patients' ages ranged between 1 day and 14 years with the mean age of 68.8 months. Of all, 872 (68.0 %) were males and 410(32.0 %) were females with a male-to-female ratio of 2.1:1.

Table 1. Sociodemographic Characteristics for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n= 1282).

Sociodemographic Characteristics			
Variables	**Category**	**Frequency**	**%**
Age	< 1 month	87	6.8
	1 – 12 months	192	14.9
	1 – 3 years	241	18.8
	3-5 years	158	12.3
	5-10 years	346	27.0
	10-14 years	258	20.1
Sex	Male	872	68.0
	Female	410	32.0

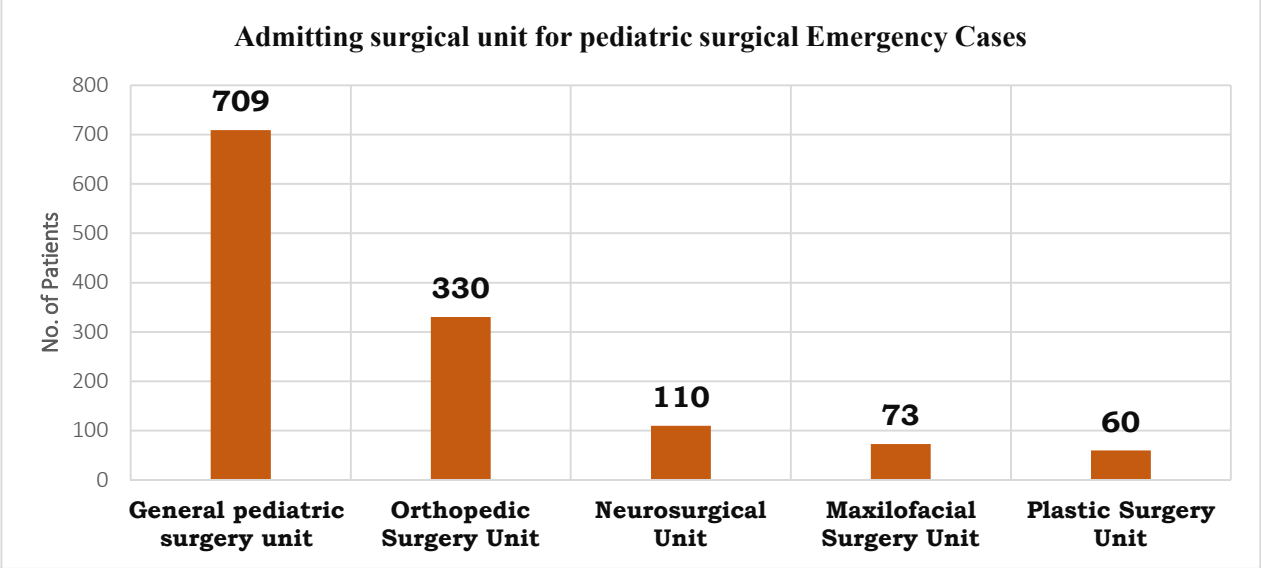

Figure 1 Admitting surgical unit for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=1282).

5.2. Characteristics of pediatric surgical emergencies

The most common pediatric surgical emergency cases seen in our study period were soft tissue surgical infection cases 350 (27.3 %) followed by Gastrointestinal surgical cases 319 (24.9%) and followed foreign body in the aero-digestive systems 157(12.2%).

Table 2 Characteristics of pediatric surgical emergencies cases for assessing Pattern of emergency pediatric surgeries at JUMC, Jimma, Ethiopia from July 2019 to July 2021 (n=1282).

Characteristics of pediatric surgical emergencies cases					
			Types of anesthesia used Count / Percent		
Disease	**Frequency**	**Percent**	**GA**	**Sedation**	**Spinal**
Soft tissue surgical infections (abscess, pyomyositis, necrotizing fasciitis, wound site infection)	350	27.3	83 (23.7%)	237(67.9 %)	29(8.4)
Foreign bodies (Aero –digestive tract)	140	11.0	58(42%)	82(59%)	-
Intestinal obstructions	136	10.6	133 (98%)	3(2%)	-
Soft tissue lacerations	98	7.6	33(34.6%)	54(55%)	11(9%)
Appendicitis(simple, perforated, appendiceal abscess)	96	7.5	96(100%)	-	-
Head injury (epidural, subdural hematoma, depressed skull fractures)	95	7.4	95(100%)	-	-
Fractures*	95	7.4	62(64.4%)	12(13.3%	21(22%
Septic arthritis	43	3.4	13(30%)	21(49%)	9(21%
Abdominal/thoracoabdominal/perineal injuries	41	3.2	32(78%)	7(17%)	2(5%)
Post-operative abdominal complications(Collections, wound dehiscence)	31	2.4	26(87%)	5(13%)	-
Post-circumcision complications (bleeding, phimosis, meatal stenosis)	30	2.3	-	30(100%	-
Air/fluid in the pleural space (chest tube insertion)	20	1.6	-	20(100%	-
Burn	19	1.5	16(89%)	3(11%)	-
Osteomyelitis	17	1.3	4(24%)	7(41%)	6(35)
Leech infestations	17	1.3	12(70%)	5(30%)	
Abdominal viscus perforation (typhoid…)	9	0.7	9(100%)	-	-
Myelomeningocele (ruptured)	9	0.7	8(89%)	1(11%)	-
IHPS	7	0.5	7(100%)	-	-
Brain abscess	6	0.5	6(100%)	-	-
Abdominal wall defects	6	0.5	6(100%)	-	-
Tracheostomy	5	0.4	4(80%)	1(20%)	-
Pericardial effusion	3	0.2	3(100%)	-	-
Testicular torsion	2	0.15	2(100%)	-	-

*Fracture also done under peripheral nerve block (2.2%) and local infiltration by the surgeon (3.3 %).

The patients' specific diagnoses categorized under soft tissue surgical infection emergencies were abscess and wound site infections 326 (25.4 %) and necrotizing fasciitis 24(1.9 %).

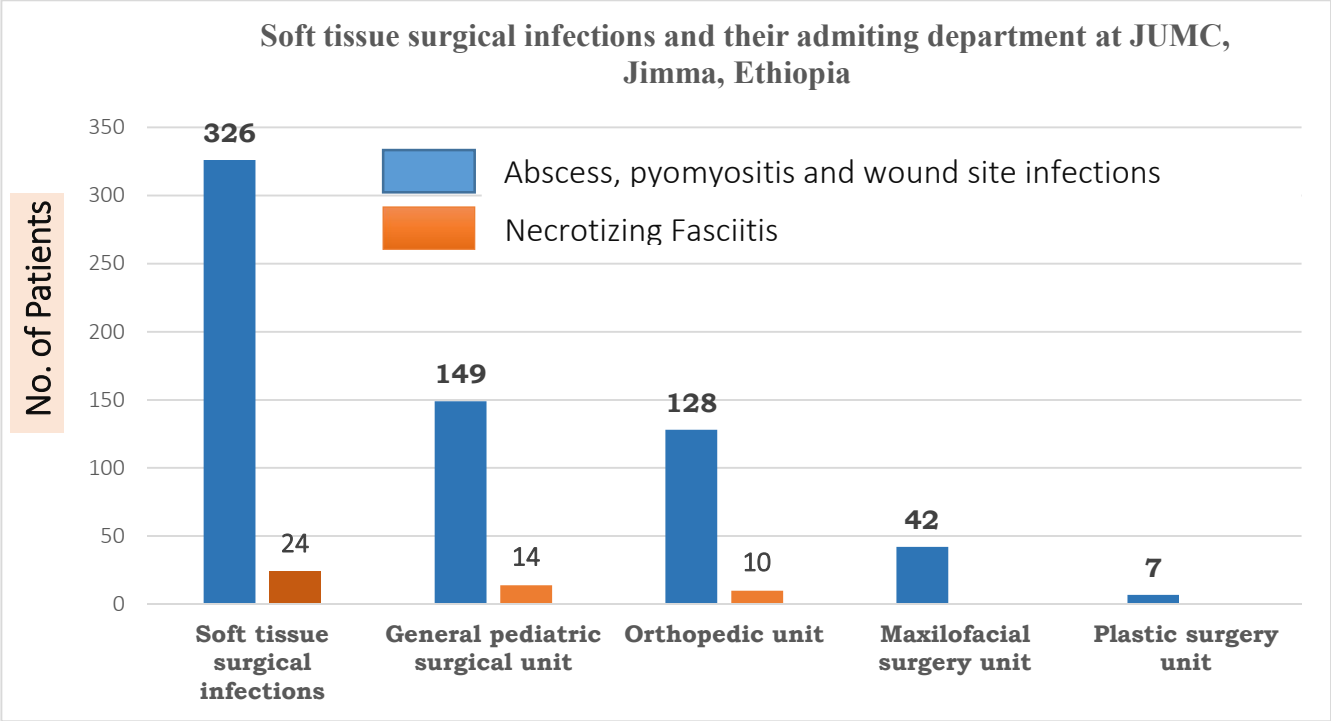

Figure 2 Characteristics Soft tissue surgical infections for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=350).

The common gastrointestinal surgical cases 319 (24.9%) in our study period were Intestinal obstructions 136 (10.6 %) and Appendicitis (simple, perforated, appendiceal abscess) 96 (7.5 %). (table 3)

Table 3 gastrointestinal surgical emergency cases for assessing Pattern of emergency pediatric surgeries at JUMC, Jimma, Ethiopia from July 2019 to July 2021 (n=319).

Gastrointestinal surgical emergency cases		
Disease Category	**Frequency**	**Percentage**
Intestinal obstructions	**136**	**10.6**
Appendicitis	**96**	**7.5**
Abdominal /Thoracoabdominal Injury	**31**	**2.4**
Post-operative abdominal complications(collections, wound dehiscence)	**31**	**2.4**
Viscus Perforation (typhoid and other spontaneous)	**9**	**0.7**
IHPS	**7**	**0.5**
Abdominal wall defects (omphalocele, gastroschisis)	**6**	**0.5**
TEF	**2**	**0.2**
Total	**319**	**24.9**

The common cause of intestinal obstruction 136 (10.6 %) in our study were intussusception 55 (4.3 %) and anorectal malformations 24 (1.9 %).

Table 4 Causes of intestinal obstruction in pediatric emergency cases for assessing Pattern of emergency pediatric surgeries at JUMC, Jimma, Ethiopia from July 2019 to July 2021 (n=136).

Causes of intestinal obstruction in pediatrics emergency cases		
	Frequency	Percent
Intussusception	55	4.3
Anorectal malformations	24	1.9
Small bowel volvulus	13	1.0
Postoperative adhesions	11	0.9
Obstructed/Incarcerated hernia	9	0.7
Hirschsprung's disease	9	0.7
Intestinal atresia and midgut volvulus	9	0.7
LBO	5	0.4
Necrotizing enterocolitis	1	0.1
Total	136	10.6

The common congenital anomalies presented with intestinal obstruction include anorectal malformations with or without fistula 24 (1.9%), Hirschsprung's diseases 9 (0.7%), intestinal atresia and mid gut volvulus 9(0.7 %). (Table 5)

Table 5 Characteristics of surgical emergency Congenital Anomalies for assessing Pattern of emergency pediatric surgeries at JUMC, Jimma, Ethiopia from July 2019 to July 2021 (n=75)

Characteristics of Surgical emergency Congenital Anomalies (n=75)		
Disease	**Frequency**	**Percent**
Anorectal malformations with or without fistula	24	1.9
Hirschsprung's diseases	9	0.7
Intestinal atresia and mid gut volvulus	9	0.7
Obstructed hernia	9	0.7
Myelomeningocele (ruptured)	9	0.7
IHPS	7	0.5
Abdominal wall defect (omphalocele, gastroschisis)	6	0.5
Tracheoesophageal fistula	2	0.2
Total	**75**	**5.9**

The common orthopedic pediatric emergencies 330 (25.7 %) were soft tissue infections (abscess and wound site infections) 122 (9.5%) and fracture 95 (7.4 %).

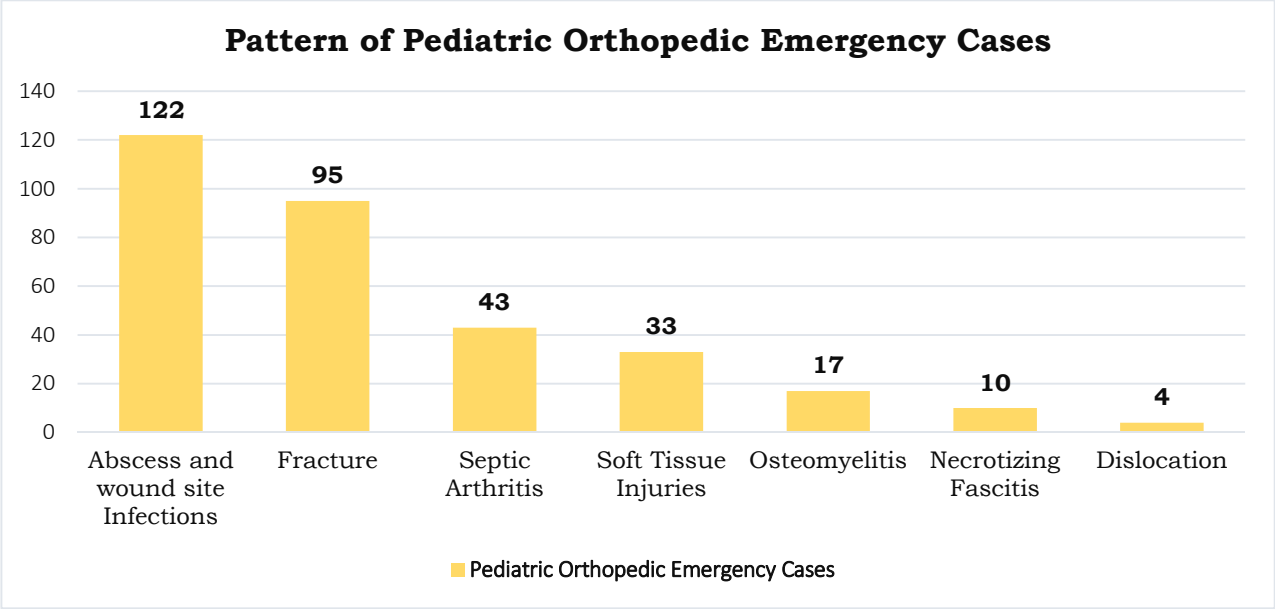

Figure 3 Orthopedic pediatric emergencies cases for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=330)

The common site of foreign body 140 (11.0 %) is in the Nostril and pharynx 54 (4.2%) and Esophagus 37 (2.9 %).

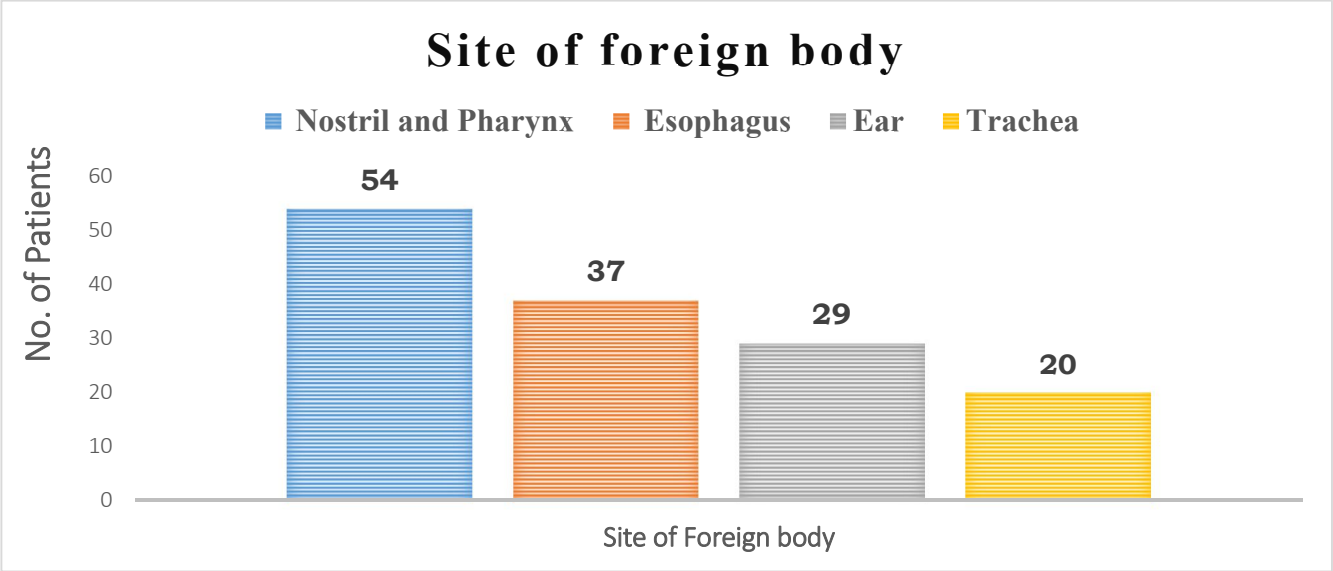

Figure 4 Site of foreign body for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=140)

Table 6 Characteristics of Neurosurgical, Cardiothoracic, Genitourinary maxillofacial and Plastic surgery pediatric emergency cases for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=313).

Characteristics of Neurosurgical, Cardiothoracic, Genitourinary maxillofacial and Plastic surgery pediatric emergency cases		
Neurosurgical Emergency Cases	Frequency	Percent
Head injury (Hematoma collections, depressed skull fractures)	95	7.4
Congenital anomalies (Ruptured MMC)	9	0.7
Brain Abscess	6	0.5
Total	110	8.6
Cardio Thoracic Emergencies	Frequency	Percent
Air/fluid in the pleural (chest tube insertion)	20	1.6
Tracheostomy	5	0.4
Pericardial Effusion	3	0.2
Total	28	2.2
Genitourinary emergency cases	Frequency	Percent
Post circumcision Complications (Bleeding, Phimosis, Meatal Stenosis)	30	2.3
Urethral and perineal Injury	10	0.8
Testicular Torsion	2	0.2
Total	42	3.3
Maxillo-facial emergency cases	Frequency	Percent
Abscess (Submental, Submandibular, Mastoid, Retropharyngeal)	42	3.3
Soft tissue injury	31	2.4
Total	73	5.7
Plastic surgical emergencies	Frequency	Percent
Burn	19	1.5
Wound site infections	7	0.5
Soft tissue injury	34	2.7
Total	60	4.7

In neonatal period we analyzed 87 (6.8 %) cases and the common surgical emergencies include GI congenital anomalies 46 (3.6%) and soft tissue infections 28 (2.2%). (Table 7)

Table 7 Characteristics of Neonatal surgical emergency cases for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=87).

Pattern of Neonatal surgical emergency cases		
Disease categories	Frequencies	Percentage
GI congenital anomalies	46	3.6
Soft tissue infections	28	2.2
Ruptured myelomeningocele	6	0.5
Post circumcision complications	5	0.4
Postoperative adhesions	1	0.08
Necrotizing enterocolitis	1	0.08
Total	**87**	**6.8**

The majority of patient operated under general anesthesia 712 (55.5 %) followed by sedation 503 (39.2 %). (Figure 5.5)

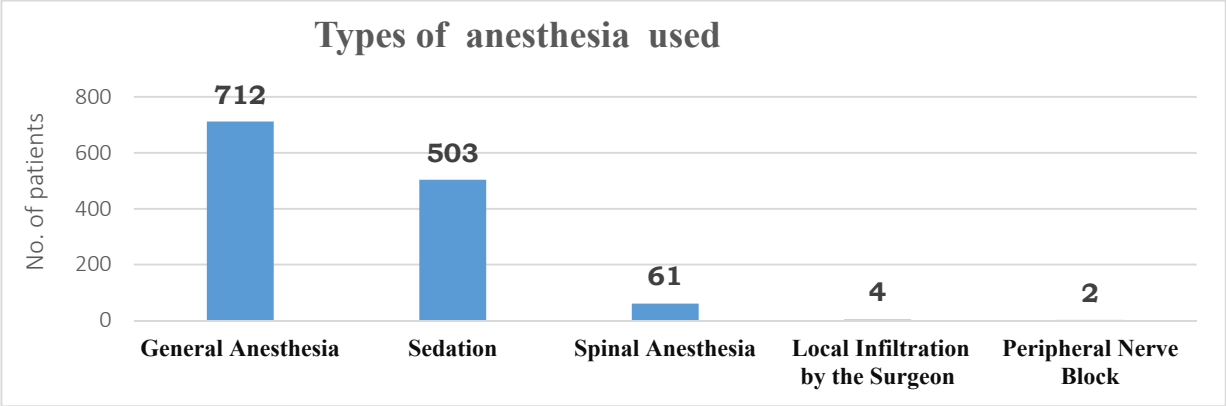

Figure 5 Types of Anesthesia used for assessing Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021 (n=1282)

6. Discussion

In this hospital based retrospective study was conducted on 1282 patients to assess the pattern of pediatrics surgical emergency at Jimma university medical center, Jimma, Ethiopia from July 2019 to July 2021. This study revealed that Patients' ages ranged between 1 day and 14 years with the mean age of 68.8 months. This result is similar with study done prospectively in 2005 on the pattern of pediatric surgical conditions at Yirgalem Zonal Hospital, Ethiopia (39)**.** And another cross-sectional study done in Somaliland (45) had also similar findings that included 1503 children the mean age was 72 months. The possible explanation for the similarity in study participants, whose age ranges from few hours to less than 15 years.

This study also showed male predominance with male to female ratio of 2.1:1. This result was consistent with studies done in Tikur Anbessa Specialized Hospital, Retrospective analysis of medical records of patient was conducted to assess the pattern, outcome and factors associated with outcome of pediatric surgical emergencies shows male to female ratio of 2.0:1**.** And also, consistent with a study conducted in the North Central Nigerian Centre (38), shows that male predominance with a 2.5:1 male-to-female ratio.

The most common pediatric surgical emergency cases seen in our study period were soft tissue surgical infection cases 350 (27.3 %) followed by Gastrointestinal surgical cases 319 (24.9%) and followed foreign body in the aero-digestive systems 157(12.2%). This result is different as compared with a study done at Tikur Anbessa Specialized Hospital; abdominal/gastrointestinal emergencies 210 (46.3%) was the commonest cases seen, followed by foreign body in aero digestive system in 133(29.3%), urogenital surgical emergencies in 27(5.9%). The other causes include superficial and deep tissue abscess collections in 22 (4.8%). This finding is quite different because our set up is the only referral hospital for many primary and zonal hospitals which don't have pediatric surgical infrastructure and resources to provide the needed surgical care for children.

In our study Trauma/ injury related cases account for more than one fourth of diagnosis. This result was relatively consistent with an according to a study conducted in Lilongwe, Malawi (36) shows that About 87 (22%) of the 392 patients who had surgery were operated on urgently. Thirty-four (23%) trauma cases, 23 (24%) congenital cases, seven (10%) infectious cases, and twenty-three (66%) acute abdominal cases necessitated emergency surgery. Also similar with the study done at Jimma University Hospital, done in 2010 shows trauma 224 (23.2%), surgical infection 202 (21.0%) and gastrointestinal problems 142 (14.7%).

This study shows that the common gastrointestinal surgical cases 319 (24.9%) in our study period were Intestinal obstructions136 (10.6 %) and Appendicitis (simple, perforated, appendiceal abscess) 96 (7.5 %). This result was consistent with a study conducted in the North Central Nigerian Centre (38) shows that

Mechanical intestinal obstruction (MIOB) was the most prevalent cause of Pediatric surgical abdominal emergencies (PSAEs) and was most commonly seen in early infancy, whereas peritonitis was the second most common cause of PSAEs, primarily in late childhood (7–12 years).

This study revealed that the common cause of intestinal obstruction 136 (10.6 %) in our study were intussusception 55 (4.3 %) and anorectal malformations 24 (1.9 %). This result was consistent with a study conducted in a study conducted at Yirgalem Hospital in Southern Ethiopia (39), shows that the most common reason for admission was intussusceptions, which accounted for 19 (14.1%) of the cases. Another prevalent finding is anorectal deformity in 7 children; early neonates with imperforate anus are also recorded in this group; males predominate 1.3:1, with a range of age of 1 month. Trauma of the limbs was the next most common surgical condition in this sample, with 18 (13.4 percent) males outnumbering females by a ratio of 2.6:1, with an age range of 6 months. Also, relatively consistent with a study conducted in Tikur Anbessa Specialized Hospital (42), shows that anorectal malformation was the most common congenital abnormality. It was responsible for 19 percent of gastrointestinal surgical admissions and 8.8% of general pediatrics surgical admissions. The second most common cause of GI was Hirschsprung disease, which accounted for 296 (13.9 percent) of GI admissions and procedures. The two most common acquired emergency abdominal illnesses needing admission and intervention were appendicitis 316 (14.9%) and intussusception 187 (8.8%).

In our study the commonest surgical neonatal case was Gastro intestinal congenital anomalies account more than half of the cases seen 46 out of 87 cases (52.2 %, n=87) and followed by soft tissue surgical infections 28 out of 87 (32 %, n= 87). This finding is consistent with a retrospective study conducted in done at Tikur Anbessa Hospital (43); Lesions of the gastrointestinal tract 282 (43.3%), mainly Anorectal malformations followed by abdominal wall defects.

Foreign body in the aero-digestive tract accounted for 157 (12.2%) of all surgical admissions, while ingested foreign bodies accounted for 10% of all admissions. This finding relatively supported by research done in Tikur Anbessa hospital which is the second most common surgical emergency case

Head injury (Hematoma collections, depressed skull fractures) account 86 % (n=110) of all neurosurgical emergencies. Post circumcision Complications (bleeding, phimosis, meatal stenosis) 30 out of 42 cases 72 % (n=42) was the most common urological emergencies requiring surgical procedures.

In this study Majority of the patients 712 (55.5%) were operated under general anesthesia. This finding is similar with the study done at Jimma University Hospital, done in 2010 , in a total of 1065 surgical procedures performed on 964 children shows majority of patient under gone under general anesthesia majority of the patients 687 (71.4%) were operated under general anesthesia.

7. Conclusion and Recommendations

7.1. Conclusion

In this study the most common pediatric surgical emergency cases were soft tissue surgical infection cases which account more than one fourth of all cases, followed by Gastrointestinal surgical emergencies about one fourth were cases and one sixth were foreign body in the aero-digestive systems. Among soft tissue surgical infection emergencies were abscess and wound site infections account majority of cases.

Among gastrointestinal surgical cases Intestinal obstructions and Appendicitis are the common cases seen. From all cases in the neonatal period accounts the common surgical emergencies include GI congenital anomalies and soft tissue infections.

Majority of patients operated under general anesthesia.

7.2. Recommendations

Most of the cases in this study were soft tissue surgical infections, and the majority of them were referred from Primary hospitals and even zonal general hospitals. This has resulted overcrowding at JUMC with cases which could have been handled by the other centers. Because of this JUMC administrative and Jimma zone health bureau may work together to fix this problem and plan to scale-up of pediatric surgical infrastructure and resources to provide the needed surgical care for children in zonal referral hospital and primary hospitals.

JUMC must adopt referral protocol and creates awareness on the adopted protocol and support those hospitals by creating guidelines and sharing experience to fix the unnecessary referral and unavailability of expertise in the referring hospitals.

Many patient have also associated trauma or injury, which can be reduced by taking preventive measures involving the policy makers and the community health education.

8. Strength and Limitation of the study

8.1. Strength of the study

The findings of this study provide a general understanding and current status of the hospital about the pattern of pediatric emergency surgical cases. In our resource-limited setups, this information is essential for guiding for better handling of referral systems.

The study also necessary to show directions of potential expansion of pediatric surgical care and to direct attentions for different surgical units in the Hospital.

Researchers can use the data from this study as a baseline for future research, and health policymakers can use it to plan and build the strategies needed to improve regarding to pediatric surgery.

8.2. Limitation of the study

The study didn't show outcomes of patient and its associated factors because further data was not available to determine the outcomes since we used operation theatre registration books.

We didn't include cases which need ophthalmologic interventions because of Poor documentation.

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Annex 1: Information Sheet & Consent Form

Pattern of emergency pediatric surgeries at Jimma university medical center, Jimma, Ethiopia: A 2 year retrospective cross sectional study.

Introduction

Hello, I am _____from JUMC and working with investigator Kedir Hussen (MD) who is doing his thesis for partial fulfillment of the requirement for a specialty certificate in anesthesiology.

In this study, data will be collected from the operation theatre log book and anesthesiology department log book retrospectively. Information regarding any specific personal identifiers like the name of the clients will not be collected and information generated will be disclosed in totality. In addition, confidentiality of any personal information will be maintained throughout the study process and no unauthorized access to the information is allowed. If you have any questions or need further information regarding the planned study, you are free to get clarification from the principal investigator, from the institution, or through the following address.

Kedir Hussen, telephone-0943051446 (principal investigator).

Email – kedir3322@gmail.com

Signature of the data collector: _____

Annex 2: Information Sheet & Consent Form Amharic version

የመጠይቅ ፈቃድ

ጂማ ዩኒቨርሲቲ ጤና ሳይንስ ኮሌጅ ፣ህክምና ትምህርት ቤት፣የአንስቴዥዮሎጂ ትምህርት ክፍል

የመጠይቅ ፈቃደኛነት ቅጽ

ስሜ_____ይባላል፡፡ እኔ በጂማ ዩኒቨርሲቲ በአንስቴዥዮሎጂ ትምህርት ክፍል የምርምር ቡድን ዉስጥ አንድ አባል ነኝ፡፡

የዚህ መጠይቅ አላማ. የ ድንገተኛ የሕፃናት ቀዶ ጥገና ንድፍ ለማዎቅ ለሚደረገው ምርምር/ጥናት /መረጃ ለመሰብሰብ ነው፡፡

በዚህ ጥናት ከቀዶ ጥገና ምዝገባ መጽሐፍ እና አንስቴዥያ ክፍል ምዝገባ መጽሐፍ 2 ዓመት ወደ ኋላ ተመልሶ የሚሰበሰበብ መረጃ ነዉ። እንደ ስም ያሉ ማንኛቸውም የግል መለያዎችን የሚመለከቱ መረጃዎች አይሰበሰቡም እና የጥናቱ ዉጤት በጠቅላላ ይገለጻል ይህም ማለት የድንገተኛ የሕፃናት ቀዶ ጥገና የሚያጋልጥ በሽታዎች የትኞች እንደሆኑ ለማወቅና ተገቢ የሆኑ እርምጃዎን ለመዉሰድ ይረዳል፡፡ በተጨማሪም ማንኛውም የግል መረጃ በሚስጥር ይጠበቃሉ እና መረጃዉን ማየት የሚችለዉ የተፈቀደለት ሰዉ ብቻ ነዉ፡፡ ጥናቱን በተመለከተ ማንኛቸውም ጥያቄዎች ካልዎት ወይም ተጨማሪ መረጃ ከፈለጉ፣ ከዋናው መርማሪ ማብራሪያ ማግኘት ይችላሉ።

ዶ/ር ከድር ሁሴን ስልክ ቁጥር 0943051446

Annex 3: Questionnaires

Code: _____

Socio Demographic Characteristics

1. Age of the Patient ---------- (months)
2. Sex **a)** Male **b)** Female
3. Admitting surgical unit ----------

Diagnosis

1. GI Abnormalities
- a. Appendicitis (Simple, Perforated and Appendiceal abscess)
- b. Intestinal obstructions
  - i. Intussusception
  - ii. Small bowel volvulus
  - iii. LBO
  - iv. Obstructed /incarcerated hernia
  - v. Postoperative adhesions
  - vi. Ileo-sigmoid knotting
  - vii. Necrotizing enterocolitis
  - viii. Other …..
- c. Abdominal / Thoracoabdominal Injury
- d. Post-operative complications (Wound Dehiscence, Collections…
- e. Typhoid perforations
- f. Congenital Anomalies
  - I. Anorectal malformations
  - II. Intestinal atresia and Midgut volvulus
  - III. Hirschsprung's disease
  - IV. Abdominal wall defect
  - V. TEF
  - VI. IHPS
  - VII. Others ----------

2. Neurosurgical emergencies
- **a)** Head injury (Hematoma collections, depressed skull fractures)
- **b)** Congenital anomalies (Ruptured MMC …)
- **c)** Brain Abscess
- **d)** Others

3. Cardiothoracic Emergencies
- **a)** Air/fluid in the pleura (Chest Tube Insertion and Manipulations)
- **b)** Tracheostomy
- **c)** Thoracic trauma
- **d)** Pericardial Effusion
- **e)** Others ----------

4. Foreign bodies
- **a)** Nostril and pharynx
- **b)** Ear

c) Trachea
d) Esophageal
e) Leech
f) Others ……..

5. Genitourinary emergencies
a) Post circumcision complications
b) Perineal and Genitourinary trauma
c) Testicular torsion
d) Twisted ovarian cyst
e) Pyonephrosis
f) Others ----------

6. Orthopedic and surgical infection emergencies
a) Surgical Infections
I. Abscess, Pyomyositis and wound site infection
a. General
b. Orthopedics
c. Maxillofacial
II. Necrotizing Fasciitis and Gangrene
a. General
b. Orthopedics
III. Septic Arthritis
IV. Osteomyelitis
V. Others ----------
b) Fracture
c) Dislocation
d) Soft Tissue Injury Repair
e) Others ----------

8. Ophthalmologic emergencies
a) Acute conjunctivitis
b) Eye trauma
c) Chemical exposure to the eye
d) Foreign objects in the eye
e) Others

Type of Anesthesia

a. General anesthesia
b. Sedation
c. Spinal anesthesia
d. Epidural anesthesia
e. Caudal anesthesia
f. Peripheral Nerve Block (Specify) _____
g. Local Infiltration

Annex 4: Assurance of principal investigator

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Institute of health faculty of medical science in effect at the time of grant is forwarded as the result of this application.

Name of the student: _____ Signature _____

Date: _____

Approval of the advisor

Name of First Advisor: _____Signature_____

Date: _____

Name of Second advisor: _____ Signature_____

Date: _____

Ref.No IHRPGM/84/2021

Date: 29/11/2021

To : Dr. Kedir Hussen

Subject: Ethical Approval of Research Protocol

The IRB of Institute of Health has reviewed your research project " **Pattern of Pediatric Emergency Surgical Procedures in JUMC**"

Thus, this is to notify that this research protocol has presented to the IRB meets the ethical and

Scientific standards outlined in national and international guidelines. Hence, we are pleased to inform you that your research protocol is ethically cleared under the following strict conditions:

1. *Any significant deviation from the methodological details indicated in the approved protocol must be communicated to the IRB before it has been implemented.*
2. *Approval shall be only for a period of twelve months. The principal investigator is required to submit an application for the renewal of the ethical approval.*
3. *The Committee must be notifi* Determinants of delayed care seeking for TB suggestive *Symptoms in Siltie Zone, Southern Ethiopia: A community based unmatched case-control study ed, in writing, of any alteration to the project including unforeseen events/circumstances that might affect the acceptability of the approved protocol.*
4. *The Principal researcher is required to immediately notify the committee in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability or amendment to the original consent form.*
5. The inability of the Principal Researcher to continue in that role, or any other change in research personnel involved in the project; should be communicated.

IRB, Chairperson

Million Tesfaye, PhD
Tel: +251917063744
E-mail: ethicsjuirb@gmail.com

Tel. +251-47 11 114 57
PBX. +251471111458-60
Fax: +251471111450
+251471112040
P.O.Box. 378
JIMMA, ETHIOPIA
e-mail: iro@ju.edu.et
website: http://www.ju.edu.et