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Clinical Presentation, Referral and Management of Pediatric Surgical  
Emergencies.

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# *DEDICATION*

*To My Parent*

*To My Wife & Son*

*To My Brothers & friend*

*And To All Children*

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## **ABBREVIATION**

<b>R.L.Q</b>	<b>Right Lower Quadrant</b>
<b>U.S</b>	<b>Ultra Sonography</b>
<b>C.T</b>	<b>Computed Topography</b>
<b>IPPV</b>	<b>Intermitted Positive-Pressure Ventilation</b>
<b>T.O.F</b>	<b>Tracheo-Oesophageal Fistula</b>
<b>O.A</b>	<b>Oesophageal Atresia</b>
<b>ED</b>	<b>Emergency Department</b>
<b>NEC</b>	<b>Necrotizing Entero Colitis</b>
<b>GIT</b>	<b>Gastro Intestinal Tract</b>
<b>L.L.Q</b>	<b>Lower Left quadrant</b>
<b>CSF</b>	<b>Cerebrospinal Fluid</b>
<b>L.U.Q</b>	<b>Left Upper Quadrant</b>
<b>BSA</b>	<b>Body Surface Area</b>
<b>ABCS</b>	<b>Airway Breathing Circulation</b>
<b>TBSA</b>	<b>Total Body Surface Area</b>
<b>RTA</b>	<b>Road Traffic Accident</b>
<b>GCS</b>	<b>Glasgow Coma Scale</b>
<b>ICU</b>	<b>Intensive Care Unit</b>
<b>CNS</b>	<b>Central Nervous System</b>
<b>X-RAYS</b>	<b>Radiographs</b>

# ABSTRACT

This study was conducted in Khartoum pediatric surgery units during period from April -November 2004.

The main objectives were: to study the clinical presentation, referral and management of pediatric surgical emergencies. To assess the pre-operative care offered to the child with suspected surgical problem and to evaluate the referral system of the surgical cases.

It is a prospective descriptive study of 136 children with emergency surgical problems. Males were 81(59.6%), where as females were 55(40.4%). The male to female ratio was 1.4:1. Newborns were the most reported age group constituting 35 (25.7%) of the study group.

The common presentations of pediatric surgical emergencies were appendicitis 37(27.2%), accidental injuries 33(24.2%) and intestinal obstruction 31(22.8%). Hydrocephalus with meningomyelocele was the commonest surgical emergencies in the newborns 12(8.8%).

The majority of children 96(70%) were referred from pediatric emergency units to surgery emergency units. In these cases first line doctors in pediatric emergency units were house officers 74(77.1%) and registrars 22(22.9%). Pediatric registrar assessed 84(87.5%) during 30 min and 12(12.5%) in more than 30 min. The pediatric consultants were informed in

about 62(64.6%) of 96 referred children, of whom 38(61.3%) were seen by the consultants

Out of 96 cases referred for pediatric emergency, 49 (51%) were referred immediately to the surgical emergency units. The remaining 47 (49%) were referred after admission for 24 hour or more. Resuscitation equipments were available in 18(13.2%) during transportation.

The first line doctor in surgery emergency units were house officers in 103(75.7%), medical officers in 25(18.4%) and registrars in 8(5.9%). Registrars or medical officers evaluated 62(45.6%) during 30 min and 74(54.4%) in more than 30 min. The consultant surgeon was notified in 111(81.6%) children.

Ninety-eight children (72.15%) of the total studied population needed operative treatment. Authorization by consultant surgeon given in 86(87.8%). Immediate post-operative care was in I.C.U for 24 (17.6%) and in the ward for others 112(82.4%).

The outcome of study showed 123 (90%) were discharged in good condition and 13 (9.6%) died. Eight newborns died constituting (61%) of the total mortality. Intestinal obstruction was the commonest cause of death (38.5%). The outcome depended on several factors including: time before the registrars saw the child, duration of stay in pediatric causality, and transportation.

## ملخص الاطروحه

تم إعداد هذه الدراسة في مستشفيات طوارئ جراحه الاطفال في ولاية الخرطوم في الفترة من ابريل حتي نوفمبر من عام 2004م. اهم اهداف الدراسة امكانية التعرف على نوعية الحالات السريرية و المحولة و الطرق المستخدمة في علاج حالات الاطفال الجراحيه الطارئة. كما هدفت الى تقييم العناية التي تقدم للاطفال قبل العمل الجراحي مع دراسة طرق تحويل تحويل الحالات الجراحية الطارئة .

كانت طبيعة الدراسة استقرائية وصفية ل136 حالة جراحية طارئة على جميع الاعمار اقل من سن 18 سنه منها 81 من الذكور و 55 من الاناث و لقد فاق عدد الذكور الاناث بنسبة 1.4:1 و لقد ظهر أن حديثي الولادة هم أكثر فئة عمرية قدوما الى حوادث الاطفال.

اظهرت النتائج النهائية ان اكثر حالات الاطفال الجراحيه الطارئة ترردا هي إلتهاب الزائده الدودية 37 حالة بمعدل 27.2% و حوادث الاصابات 33 حالة بمعدل 24.2% و الانسداد المعوي 31 حالة بمعدل 22.8% اما اكثر الحالات الطارئة الجراحية و سط حديثي الولاده هي موه الراس المترافق مع قيلة سحائية نخاعية 12 حالة بمعدل 8.8%

تبينت ان معظم الحالات المحولة الى طوارئ قسم الجراحة قدمت من طوارئ قسم الاطفال و قد بلغت 96 حاله بمعدل 70%. و لقد بلغ عدد الحالات اللاتي قام اطباء الامتياز بالكشف الاولي عليها في حوادث قسم الاطفال 74 حالة بمعدل 77.4% في حين بلغ عدد الحالات اللاتي قام اطباء نواب إختصاصي الاطفال بالكشف الاولي عليها 22 حاله بمعدل 22.9%

تم تقييم 84 حالة بمعدل 87.5% بواسطه نواب اختصاصي الاطفال في خلال 30 دقيقه و 12 حاله بمعدل 12.5% في اكثر من 30 دقيقه. تم اخطار اختصاصي الاطفال بأن هنالك 62 حالة

بمعدل 64.6% تم تحويلها الى طوارئ قسم جراحه الاطفال، في حين تمكن اختصاصي الاطفال من معاينه 38 حالة بمعدل 61.6 قبل تحويلها من اجمالي الحالات الي يخطر بها تم تحويل 49 حالة بمعدل 51% مباشرة عقب الكشف السريري في طوارئ قسم الاطفال الى طوارئ قسم الجراحه ، في حين تم تحويل 47 بمعدل 49% بعد ادخالها و قضائها فترة تتراوح الى 24 ساعه او اكثر في قسم الاطفال . توفرت و سائل الانعاش اثناء تحويل 18 حالة بمعدل 13.2 % الى طوارئ قسم جراحه الاطفال.

لقد بلغ عدد الحالات اللاتي قام اطباء الامتياز بالكشف الاولي عليها في طوارئ قسم جراحه الاطفال 103 حالة بمعدل 75.7% في حين بلغ عدد الحالات اللاتي قام الاطباء العموميين بالكشف السريري الاولي عليها 25 حاله بمعدل 18.4% اما اطباء نواب اختصاصي الجراحه قامو بالكشف الاولي على 8 حالات بمعدل 5.9%.

تم تقييم 62 حالة بمعدل 45.6% بواسطة نواب اختصاصي الجراحه او الاطباء العموميين في خلال 30 دقيقه ، و 74 حاله بمعدل 54.4% في اكثر من 30 دقيقه. تم اخطار اختصاصي الجراحه بان هنالك 111 حالة بمعدل 81.6% تم ادخالها الى قسم طوارئ جراحه الاطفال . لقد اظهر الكشف السريري بان هناك 98 حاله بمعدل 72.2% تحتاج الى العمل الجراحي . منح اختصاصي الجراحه 86 تفويضا بمعدل 87.8% لاجراء العمل الجراحي . تم ادخل 24 حالة بمعدل 17.6% الى قسم العناية المكثفه و 112 حاله بمعدل 82.4% الى داخل قاعات المرضى.

اظهرت النتائج ان المحصلة النهائية للدراسة هي شغاء 124 حالة بمعدل 90% و وفاة 13 حالة بمعدل 9.6% . لقد كانت اعلى نسبه وفيات وسط حديثي الولاده حوالي 8 حالات بمعدل 61% . لقد كان الانسداد المعوي اكثر الحالات مسؤليه عن الوفيات 5 حالات بمعدل 38.5%

كان واضحا بان هنالك عدد من العوامل تؤثر في المحصلة النهائيه و هي المده قبل معاينه نواب اختصاصي الاطفال للحالات و مده بقائها في طوارئ قسم الاطفال وطريقه التحويل

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## **Introduction and Literature Review**

### **1.1 Background:**

Pediatric surgical emergencies consist of different groups of diseases. Congenital deformities are such as esophageal atresia, gastroschisis, congenital diaphragmatic hernia, and myelomeningocele. Emergency surgical situations beyond the neonatal period are acute abdomen and ileus, esophageal varices, and pneumothorax. The third group consists of accidental injuries, which are blunt abdominal trauma, cranio-cerebral, and burns<sup>(1)</sup>.

A quarter of pediatric surgical emergencies are non-trauma and most of them are limping child, acute abdominal pain, and acute scrotum. All of the child's lower limb pathology can be described as a limp, and the same is true for abdominal pain and acute scrotum<sup>(2)</sup>.

### **1.2 Acute abdominal pain**

Acute abdominal pain is one of the most frequent cause of admission to an emergency department in children's hospital<sup>(3)</sup>.

Pediatric abdominal surgical emergencies may present to the primary physician a diagnostic challenge. A systemic approach will help to minimize missed diagnosis and resultant complications. It must always be kept in mind that children often have atypical presentations of common entities. So the clinical examination must be meticulous and

repeated in order to assess the evolution of the abdominal syndrome and to adapt the para clinic examination. Prudent and direct use of laboratory and imaging studies will minimize miss diagnosis<sup>(3-4)</sup>.

Many disorders must be considered in the differential diagnosis of acute abdomen. Emergency surgery should not be considered until the differential diagnosis has been completed. All the abdominal pains are not surgical but justify an admission for observation in a pediatric surgical department<sup>(3-5)</sup>.

### **1.3 Etiologic classification of acute abdomen:**

#### **1.3.1 Mechanical obstruction:**

##### **Intraluminal obstruction:**

Causes such as: foreign body, Bezoar, Fecolith, gallstone, parasites, distal intestinal obstruction syndrome of cystic fibrosis, tumor and fecaloma<sup>(5)</sup>.

##### **Extraluminal obstruction:**

Causes such as: Hernia, Intussusception, volvulus, duplication, stenosis, tumor, mesenteric cyst, superior mesenteric artery syndrome, and pyloric stenosis.<sup>(5)</sup>

#### **1.3.2 Inflammatory Diseases and Infection:**

These include three groups:

##### **Gastrointestinal Diseases:**

Causes include: Appendicitis, Crohn disease, Ulcerative colitis, Henoch-Schonlein purpura and other causes of vasculitis, peptic ulcer, Meckel's diverticulitis, acute gastroenteritis, and pseudomembranous enterocolitis<sup>(5)</sup>.

#### **Paralytic Ileus :**

Causes of **paralytic ileus** include sepsis, pneumonia, pyelonephritis, peritonitis, pancreatitis, cholecystitis, renal and bladder stones, pelvic inflammation, and lymphadenitis due to viral or bacterial infection<sup>(5)</sup>.

#### **Miscellaneous:**

These include lead poisoning, sickle cell crisis, Familial Mediterranean fever, Porphyria, diabetic acidosis, Addisonian crisis, torsion of testis and torsion of ovarian pedicle<sup>(5)</sup>.

#### **1.3.3. Blunt Trauma:**

Accident and Battered child syndrome<sup>(5)</sup>.

### **1.4. Acute appendicitis:**

#### **Description:**

Acute appendicitis is the most common condition requiring emergency abdominal operation in childhood<sup>(6)</sup>. Missed appendicitis is also a frequent cause of professional liability in Emergency Department<sup>(7)</sup>. A diagnosis is difficult in children, a

factor contributing to perforation rates of 30-60%. Fifty per cent of children with perforated appendicitis have been seen by a physician before the diagnoses<sup>(6)</sup>.

Appendicitis is rare in developing countries, where diets are high in fiber. The incidence of appendicitis increases with age, peaking in adolescence and rarely occurring in children younger than 1 year. Males predominate, with familial predilection to appendicitis has been reported<sup>(6)</sup>.

### **Etiology:**

Obstruction of the lumen is the prime cause of appendicitis. The obstruction is caused by inspissated fecal material (Fecolith). Obstruction resulting from edema may be associated with systematic or enteric viral or bacterial (e.g Yersinia, Salmonella, shigella) infection<sup>(6)</sup>.

### **Clinical Manifestation:**

The classic triad consists of pain, vomiting, and fever. In the initial stage the pain is periumbilical. Emesis usually follows the onset of pain and is infrequent. Anorexia is more common. Fever is low grade unless perforation with peritonitis has occurred. The sequence of symptoms with pain preceding emesis and fever is important in distinguishing appendicitis from infection enteritis, which usually begins with vomiting followed by the crampy pain of

hyper peristalsis. Diarrhea if it occurs is infrequent and consists of small, mucous stools caused by irritation of sigmoid colon. Similarly, irritation of bladder may produce urinary symptoms such as frequency and urgency<sup>(6)</sup>.

As the inflammation progresses to involve the serosa and overlying peritoneum, the pain migrates usually to right lower quadrant, accompanied by signs of peritoneal irritation. With perforation the pain becomes generalized unless the contamination is well localized to produce a discrete abscess, usually of the R.L.Q. Palpation of an abdominal or rectal mass indicates abscess formation. The progression from onset of symptoms to perforation usually occurs over 36-48hr. If the diagnosis is delayed beyond 36-48hr, the perforation rate exceed 65%.<sup>(6)</sup>

The physical examination of the abdomen may prove difficult due to the child's fear of the pain that is to be elicited. If necessary it is useful therefore to use the child's own hand to palpate the abdomen. Percussion rebound is a valuable means of identifying peritonism and is the least painful. Appendicitis may complicate respiratory infection or gastroenteritis and it is essential to perform repeated abdominal examination in doubtful cases in order not to miss the diagnosis<sup>(8)</sup>.

### **Investigations:**

Laboratory evaluation consists of complete blood count and urine analysis. Although many children with appendicitis have leukocytosis or shift in differential, many do not. The primary role of laboratory studies is to exclude alternative diagnosis such as urinary tract infection, hemolytic –uremic syndrome, Henoch – Schonlen purpura, sickle cell disease and others. Imaging studies that may be helpful in evaluation of children with suspected appendicitis include plain radiographs of the abdomen or chest, US, CT, and rarely barium enema<sup>(6)</sup>.

### **Treatment:**

Preoperative preparations with intravenous fluids and antibiotics. Appendectomy should be done within a few hours of establishing the diagnosis .If the appendix has perforated, especially with peritonitis, significant fluid restriction, broad spectrum antibiotics and nasogastric suction may be required a few hours before appendectomy<sup>(6)</sup>

## **1.5.Intestinal obstruction**

### **Description**

Occurs in approximately 11,500 live births. Obstruction may be parietal or complete and may arise from intrinsic or extrinsic abnormalities of gut. Obstruction can be further classified as simple or

strangulating. Simple obstruction is associated with the failure of progression of aboral flow of luminal contents. Strangulating obstruction is associated with impaired blood flow to the intestine in addition to obstruction of the flow of luminal contents. If strangulating obstruction is not promptly relieved, it may lead to bowel infarction and perforation<sup>(9)</sup>

### **Clinical presentation:**

Varies with the cause, level of obstruction and time between the obstruction event and the patient's evaluation. The classic symptoms of obstruction include nausea and vomiting, abdominal distention and constipation. Obstruction high in intestinal tract involving the duodenum or proximal jejunum result in large volume, frequent, bilious emesis. Pain is intermitted and is usually relieved by vomiting. The pain is localized to the epigastrium or periumbilical area, and there is little abdominal distention. Obstruction in the distal small bowel leads to moderate or marked abdominal distention with emesis that is progressively feculent. Pain is usually diffuse over the entire abdomen<sup>(9)</sup>.

Bowel obstruction is almost always suggested on the basis of history and physical examination. No laboratory studies are diagnostic of obstruction or differentiate simple obstruction from obstruction associated with bowel infarction. Imaging is used to

confirm the diagnosis and localize the area of obstruction. Plain spine and erect or decubitus roentgenograms are the initial studies. U/S is helpful in identifying pyloric stenosis and possibly volvulus or intussusception and differentiating pyloric stenosis from other causes of proximal obstruction. Contrast studies of the bowel are indicated when plain films or U/S fail to identify the source of obstruction<sup>(9)</sup>.

**Treatment:**

Initial treatment: fluid resuscitation and stabilizing the patient. Nasogastric decompression usually provides relief of pain and vomiting. After appropriate cultures, broad-spectrum antibiotics are usually started in neonates with bowel obstruction and those with suspected strangulating infarction. Patients with strangulation must have immediate surgical relief before the bowel infarcts, resulting in gangrene and intestinal perforation. Extensive intestinal necrosis results in short gut syndrome. Non-operation conservation management is usually limited to children with suspected adhesions or inflammatory strictures that may result with nasogastric decompression or anti-inflammatory medication. If Clinical signs of improvement are not evident within 12-24 hr then operative intervention is usually indicated<sup>(9)</sup>.

## **1.6. Intussusception:**

### **Description:**

It is a process in which a segment of intestine invaginates into the adjoining intestinal lumen, causing a bowel obstruction<sup>(10)</sup>. It is the most frequent cause of intestinal obstruction in the first 2 years of life<sup>(5)</sup>.

### **Etiology and Epidemiology:**

The cause of most intussusception is unknown (idiopathic). Correlation with adenovirus infection has been noted, and the condition may complicate otitis media, gastroenteritis, or upper respiratory infection<sup>(9)</sup>.

Its peak incidence is in the spring and autumn and is thought to arise due to an increase in size of lymphatic tissue in the small intestine. This forms a polyp-like intrusion into the bowel lumen, the bowel tries to propel the polyp down the lumen by peristalsis and in so doing inverts the bowel into itself. There is obstruction of the bowel proximal to the intussusception, and in extreme cases, the bowel may be passed through the anal canal<sup>(8)</sup>.

Two thirds of children with intussusception are younger than one year. Although extremely rare, intussusception has been reported in the neonatal period. Intussusception can account for as many as 25% of abdominal surgical emergencies in children

younger than 5 years, exceeding the incidence of appendicitis. Male-to female ratio of approximately 3:2<sup>(10)</sup>.

In about 2-10% of patients, recognizable lead points for the intussusception are found, such as inverted appendiceal stump, Meckel diverticulum, an intestinal polyp, duplication or lympho sarcoma. Uncommonly the condition complicates Henoch-schonlein purpura<sup>(9)</sup>.

### **Clinical presentation:**

The classic triad of intussusception are vomiting, abdominal pain, and passage of blood per rectum. Occurs in only one third of patients. These symptoms often are preceded by an upper respiratory infection. Pain is colicky, severe and intermittent. The child draws his legs up to the abdomen and kicking the legs in the air. Initially, vomiting is non bilious and reflexive, but when the intestinal obstruction occurs, vomiting becomes bilious .Any child with bilious vomiting is assumed to have a condition that must be treated surgically until proved otherwise. Parents report the passage of stools like currant jelly. This is a mixture of mucus, sloughed mucosa, and shed blood. Lethargy is relatively common presenting symptom. The reason lethargy occurs is unknown, since lethargy has not been described with other forms of intestinal obstruction. Lethargy can be the sole presenting symptom, which makes the

diagnosis challenging. Diarrhea can also be an early sign of intussusception<sup>(10)</sup>.

On physical examination the patient is usually chubby and in good health. Intussusception is uncommon in malnourished children<sup>(10)</sup>.

The physical findings are a right hypochondrium sausage-shaped mass and emptiness in the R.L.Q (Dance sign) this is hard to detected and is palpated at best when the infant is quiet between spasms of colic. After a while the child develops a fever and signs of dehydration<sup>(8)</sup>.

Abdominal distention frequently is found if obstruction is complete. A rare presentation of intussusception is prolapse of the intussusceptum through the anus. Patients with intussusception often have no classic signs and symptoms, which can leads to an unfortunate delay in diagnosis and can have disastrous consequences<sup>(10)</sup>.

### **Differential Diagnosis:**

It may be particularly difficult to diagnose intussusception in a child who already has gastroenteritis; a change in the characters of pain to more sever, or the nature of vomiting or the onset of rectal bleeding should alert the physician. Other differential diagnoses are appendicitis, colic, cyclic vomiting

syndrome, Mekel diverticulum, incarcerated hernia, internal hernia milk allergy, volvuls and other causes of intestinal obstruction<sup>(9-10)</sup>.

### **Investigations**

Laboratory investigation usually is not helpful in the evaluation of patients with intussusception. Imaging studies: Plain radiograph findings may be normal early in the course of intussusception. As the disease progresses, earliest radiographic evidence includes an absence of air in the right lower and upper quadrants and a right upper quadrant soft tissue density present in 25-26% of patients. These finding are followed by an obvious pattern of small bowel obstruction, with small bowel dilatation and air-fluid levels in the small bowel only. If the distention is generalized and the air-fluid levels also are present in the colon, the findings more likely represent acute gastroenteritis than intussusception. A left lateral decubitus view is also is helpful. If the view exhibits air in the cecum, the presence of ileocecal intussusception is highly unlikely .Ultrasonography show depiction of the intussusception and mesentery within the intussusceptions ( target and pseudokidney signs). Computed topography (CT) scan also has been proposed to be useful making the diagnosis of intussusception; however, CT finding are unreliable, and use of CT carries the risks associated with intravenous contrast

administration, radiation exposure, and sedation. The traditional and most reliable way to make the diagnosis of intussusception in children to obtain a contrast enema (either barium or air). Contrast enema is quick and reliable and has the potential to be therapeutic. Exercise caution when performing contrast enema in patients than 3 years because most patients older than 3 years have a surgical lead point in the small bowel, and the diagnostic and therapeutic yield of the enema is lower in these patients.<sup>(10)</sup>

### **Treatment:**

For all children start intravenous fluid resuscitation and nasogastric decompression as soon as possible. Reduction of an acute intussusception is an emergency procedure and performed immediately after diagnosis in preparation for possible surgery<sup>(9-10)</sup>.

### **Prognosis:**

Untreated intussusception in infant is almost always fatal; the chances of recovery are directly related to duration of intussusception before reduction. Most infant recovers if the intussusception is reduced within the 24hr, but the mortality rises rapidly after this time, especially after 2 day. Spontaneous reduction during preparation for operation is not uncommon<sup>(10)</sup>.

## **1.7 Hernia**

### **1.7.1. Inguinal hernia**

It is a peritoneal sac that precedes the testicle as descends from the genital ridge to the scrotum. Most inguinal herniae are of the indirect type and occur much more frequently (9:1) in boys than in girls. Hernias may be present at birth or may appear at any age thereafter. The incidence in premature infants is close to 5%. Inguinal hernia is reported in 30% of infants weighing 1000 g or less.<sup>(5)</sup>

No symptoms are associated with an empty processus vaginalis. In most cases, a hernia is a painless inguinal swelling of variable size. A history of inguinal fullness associated with coughing or long periods of standing may exist; or a firm, globular, and tender swelling, sometimes associated with vomiting and abdominal distention, may be present<sup>(5)</sup>.

Spontaneous reduction frequently occurs during sleep or with slight external pressure. In some instances, a herniated loop of intestine may become partially obstruction. Rarely, bowel becomes trapped in the hernia sac and complete intestinal obstruction occurs. Gangrene of the hernia contents or testis may occur; in the female, the ovary may prolapse into the hernial sac. Inspection of the two inguinal areas may reveal a characteristic bulging or mass.

Infant should be observed for evidence of swelling after crying and older children after bearing down .A suggestive history is often the only criterion for diagnosis, along with the “silk glove” feel of the rubbing together of the two walls of the empty hernial sac<sup>(5)</sup>.

Manual reduction of incarcerated inguinal hernias can be attempted after the sedated infant is placed in the Trendelenburg position with an ice bag on the affected side. This is contraindicated if incarceration has been present for more than 12 hours or if bloody stools are noted. Surgery is usually indicated if a hernia has once incarcerated<sup>(5)</sup>.

### **1.7.2.Umbilical hernia**

Umbilical hernias are more common in premature than in full-term infants. Small bowel may incarcerate in small-diameter umbilical hernias. Most umbilical hernias regress spontaneously if the fascial defect has a diameter of less than 1 cm. Large defects and smaller hernias persisting after age 4 years should be treated surgically. Reducing the hernia and strapping the skin does not accelerate the healing process<sup>(5)</sup>.

### **1.8.Acute scrotum:**

#### **Description:**

Acute scrotum pain in children presents a major diagnostic and therapeutic challenge<sup>(11)</sup> .It is mainly related to surgical causes<sup>(12)</sup> Scrotal

pathology in pediatrics ranges from the more benign hydrocele and varicocele to acute testicular torsion requiring emergent surgery. Malignant testicular tumors can be insidious in onset or may present acutely when trauma brings a swollen scrotum to the patient or physician's attention. Three common conditions can present as an acute scrotum, all of which can suggest testicular torsion clinically<sup>(13)</sup>.

Epididymitis often has a less acute onset than testicular torsion, although it does not always present with straightforward diagnosis. It is an inflammatory process-affecting male from 9 to 14 years of age, it can be seen in younger males with Henoch-Schonlein purpura and Kawasaki disease. Torsion of the appendix of the testis and epididymis can present acutely and mimic acute testicular torsion and generally occurs from 6 to 12 years of age. Testicular torsion itself usually occurs from 12 to 18 years of age and usually results from the anatomical 'bell and clapper' deformity. Infarction of the testis can occur within as early as 4 to 6 hours after torsion, depending on the duration of symptoms and degree of twist of the spermatic cord<sup>(13)</sup>.

Spermatic cord torsion is found in two age ranges, namely: the neonatal period, where it usually represents the evolution of an intrauterine process, and the peripubertal period, which is more

frequent<sup>(11)</sup>. Patients presenting with a tender testicular and absent cremasteric reflex were more likely to have a testicular torsion than epididymitis or torsion of appendix testis .An absent cremasteric reflex was the most sensitive physical finding for diagnosing testicular torsion<sup>(14)</sup>.

**Treatment:**

Epididymitis: Empiric therapy is indicated before culture results are available, an adjunct to therapy, bed rest, scrotal elevation, and analgesic are recommended until fever and local inflammation subside<sup>(15)</sup>. Torsion of the appendix testis, however, can usually be managed without surgery. Since the presentations of epididymitis and testicular torsion overlap, it is sometimes difficult to rapidly make the correct diagnosis. Early genitourinary consultation is appropriate in this setting<sup>(16)</sup>.

Any patient with short duration of pain and whom testicular torsion is strongly considered should under go immediate exploratory surgery without diagnostic studies. If the findings overlap or the duration of pain more than 12 hour, immediate testicular radionuclide scanning should be arranged; alternatively, with experience, Doppler sonography can be carried out. If these radiographic studies cannot be arranged and interpreted within one to two hours, scrotal exploration should be performed. Any patient

with an acute scrotal complaint and a negative scan should receive daily follow-up until symptoms subside<sup>(16-17)</sup>.

## **1.9. Neonatal surgical emergencies**

The transitional period following birth can be complicated by the presence of congenital anomalies requiring emergent surgical management. Newborns with congenital diaphragmatic hernia require immediate intubation and gastric decompression to minimize gastric distention, as well as cautious ventilation to avoid pneumothorax. Newborns with omphalocele and gastroschisis are at risk for bacterial contamination. As well as heat and evaporative losses from exposed viscera. These newborns benefit from the use of a protective bowel bag. Newborns with meningomyelocele require meticulous care to avoid infection and trauma to exposed portions of the spinal cord<sup>(18)</sup>.

### **1.9.1 Exomphalos**

It is the partial or total persistence of the midgut within the umbilical cord where it usually undergoes development between the 6th and 14th weeks of intrauterine life; it occurs once in every 6000 births. Exomphalos minor is the herniation of one or two loops of bowel into the base of the cord whereas exomphalos major is the complete failure of the return of the midgut. In the latter there

is a huge swelling in the center of the abdomen produced by the whole midgut covered by a membrane<sup>(8)</sup>.

Another related condition is gastroschisis, where loops of bowel herniate through an opening in the abdominal wall to the right of the umbilical cord; it has no covering. Surgical repair is the treatment of choice, although this can be difficult, especially in exomphalos major in which there may be insufficient development of the anterior abdominal wall to close the abdominal defect without respiratory embarrassment<sup>(8)</sup>.

### **1.9.2 Congenital diaphragmatic hernia:**

#### **Description:**

Usually, diaphragmatic hernia presenting in the newborn period is posterolateral (foramen of Bochdalek ) or complete agenesis of the diaphragm. Hernias are more common on the left. The incidence is 1 in 2000 live births<sup>(19)</sup>

#### **Diagnosis:**

Suspected in any baby who fails to respond satisfactory to incubation or bag-and-mask resuscitation at birth especially in the presence of maternal polyhydramnios. Confirmatory clinical signs such as barrel chest, displaced apex beat and scaphoid abdomen with unequal air entry should then be looked for. Definite

diagnosis is by X-ray of the chest and abdomen combined, showing loops of bowel in the chest and contralateral displacement of the mediastinum<sup>(19)</sup>.

**Management:**

In the labour suite: bag-and-mask resuscitation may cause gastric distension and worsen respiratory distress. Intubate and insert a nasogastric tube (8F) to decompress the intrathoracic viscera. Nurse head up or flat. Transfer to the special care baby unit on intermitted positive-pressure ventilation (IPPV) .The optimum time for operation is contentious. Recent evidence suggests that maximum medical support initially, with operative treatment delayed until a stable satisfactory state has been achieved, may improve results. This is not always possible, but operation on a grossly acidotic and hypoxemic baby is not likely to be successful<sup>(19)</sup>.

**1.9.3 Tracheo - Oesophageal Fistula (TOF)**

**and Oesophageal Atresia:**

**Description:**

Five main types exist. All are due to failure of oesophagus and trachea to differentiate in early embryonic life. The most

common type (87%) is oesophageal atresia with distal tracheo-oesophagel fistula<sup>(19)</sup>.

The next most common type (8%) is oesophageal atresia without fistula. An X-ray at a few hours of age shows complete absence of bowel gas shadows. Fifty per cent are associated with other gastrointestinal abnormalities (duodenal atresia and anorectal anomalies) and cardiovascular malformation. Occasionally there is a family history. The incidence is 1 in 3000 live births<sup>(19)</sup>.

### **Diagnosis:**

This should be made before feeding; otherwise there is a high of aspiration. There is usually a history of maternal polyhydramnios. All babies born to mother with polyhydramnios and all 'mucousy' babies should have a gastric tube passed (French) as soon as possible after birth. In the delivery suite the distal end of a mucus trap may be used. If oesophageal atresia is present the catheter will usually not pass more than 8-10cm from the gum margin. The diagnosis should be confirmed by combined chest and abdominal-X-ray with a radio-opaque tube in the oesophagus. This will show the level of the oesophageal pouch and may reveal pulmonary consolidation due to aspiration. In the case of oesophageal atresia without fistula, abdominal X-ray shows a complete absence of bowel gas shadows. Aspiration may occur

either from the upper pouch or from the stomach via the distal fistula (the latter is more common and more important<sup>(19)</sup>).

### **Management:**

A Replogle tube should be passed into the oesophageal pouch and kept on low suction. The baby should be nursed head up to avoid aspiration of stomach secretion and to maximize the effect of the Replogle tube. Surgery is performed as soon as the baby's condition is stable. It may be delayed in order to improve pulmonary function with physiotherapy and antibiotics if aspiration has occurred<sup>(19)</sup>.

### **The 'H' type tracheo-oesophageal fistula**

This will not be diagnosed by failure to pass a nasogastric tube and usually presents later with episodes of cyanosis after feeds, or recurrent pneumonia. Diagnosis suspected clinical with a positive 'bubble test'. A large nasogastric tube is passed and then gradually withdrawn up the oesophagus with the proximal end under water. Bubbling should occur when the tip has reached the level of fistula unless the tube or fistula is full of mucus. The diagnosis should be confirmed at fluoroscopy, when a small amount of Dionesil is trickled down the oesophagus from a fine catheter. The fistula is usually seen at level C7 or T1, and usually fills by reflux<sup>(19)</sup>.

#### **1.9.4.Hirschsprung's disease**

This condition is due to a failure of the myenteric plexus of the bowel to migrate, leading to aganglionosis of bowel. The condition always starts in the distal rectum but may spread into the small intestine. Inability of the bowel to contract adequately leads to a failure in peristalsis and then constipation. Hirschsprung's disease is the commonest cause of intestinal obstruction in new born, with a 4:1 male predominate and in 90% of cases presents in the first three days of life. Although usually apparent in the neonatal period, occasionally, if the defect is short enough, the condition may not be diagnosed until adult life; there will however be a history of lifelong constipation, the history in the neonate is of a failure to pass meconium in the first two to three days of life. Meconium is usually passed after the passage of a finger into the rectum. The rectum is empty and contracted, and the anus normal. If the obstruction is low, the finger may enter the dilated normal rectum. After removing the finger there is a large gush of flatus and meconium and there may be in intermittent passage of stool for a short while before constipation returns. The abdomen becomes increasing distended, and borborygmi and visible peristalsis become ever more obvious. In many cases the proximal colon

becomes increasingly enlarged, i.e. a megacolon and may in time perforated. The initial treatment is to raise a stoma of normal colon to allow decompression and passage of stool from the colon; restorative surgery is performed later<sup>(8)</sup>.

#### **1.9.5. Imperforate anal membrane:**

The infant fails to pass meconium, and a greenish bulging membrane is seen in the anal aperture<sup>(5)</sup>. Definitive surgical correction is delayed; a defunctioning colostomy is raised soon after birth<sup>(8)</sup>.

#### **1.9.6. Spina bifida and meningomyelocele :**

Spina bifida is a failure of mid-line fusion of vertebral bodies. Meningomyelocele is a cystic herniation of both meninges and cord through the bony defect, commonly a large lumbar or thoracic defect. Frequent associated with major neurological deficit. Spina bifida with meningomyelocele is common diagnosed in the neonatal period. Factors predictive of severe disability such as: gross hydrocephalus at birth or microcephaly, kyphosis or scoliosis, absence of voluntary movement below L3 and major associated defects. Aggressive, non-surgical closure of these defects has led to survival of many children with multiple severe handicaps. The final decision on early surgery rests with parents and attending doctors. While awaiting preoperative assessment,

cover the lesion with sterile gauze soaked in saline and pay attention to temperature stability<sup>(19)</sup>.

### **1-10 Global experience:**

In Chicago 1992 a prospective study of 377 children (two to 16 years old) presenting with abdominal pain in pediatric emergency department showed that patients presenting with abdominal pain often leave with the diagnosis of abdominal pain. Of the patients contacted, the majority reported that their pain has resolved. A diagnosis of appendicitis should be considered in any patient with any two of the following signs or symptoms: vomiting, guarding, tenderness, or RLQ pain<sup>(20)</sup>

Another study in Chicago 1993 about missed appendicitis in 87 patient. The patients included 43 girls and 44 boys (mean age, 8.9 years). Six patients (7%) were seen twice before the diagnosis of appendicitis was made. They returned to ED on average 29 hours after first visit. The ED discharge diagnosis of the missed patients included: probable

Campylobacter, viral urinary tract infection, gastroenteritis and abdominal pain. The missed patients were different from the other patients with appendicitis. They were more likely to have normal appetite, to have diarrhea and to be afebrile. All the patients had at least two of the following signs and symptoms: vomiting, tenderness, guarding, and right lower quadrant (RLQ) pain. At the time of surgery, 23/81(28%) of the one-visit group had ruptured

appendix, whereas 3\6 (50%) of the missed patients had a ruptured appendix<sup>(7)</sup>.

In USA 2000 a study about appendicitis in the young child (a continuing diagnostic challenge) showed that the most common presenting symptom was abdominal pain (94%); the most common sign was abdominal tenderness (95.8%). Tenderness was generally diffuse if perforation had occurred (62%) or focal in non-perforated group (61%). The duration of symptoms in patients with perforation was more than double that of the non-perforation. Patients under went a separate medical evaluation prior to arriving at definitive diagnosis in 44.2% cases. At the time of surgery, 74% were found to have evidence of perforation and 47% of these patients had an abscess formation. The rate of perforation increase as the age of the patient decreased 100% for age 1 to 69% for age 5years.Perforation results in a significant increase in hospital length of stay and rate of abscess formation<sup>(21)</sup>.

In Portuguese 1994 a retrospective study about acute appendicitis showed 267 patients were operated upon for acute appendicitis representing 97% of emergency laparotomies. The most frequent symptoms were abdominal pain 99% and anorexia 86%. Referral of surgical evaluation was made in 35.8% of cases 48 hours after the onset of symptoms<sup>(22)</sup>.

In Providence 1988 a study about diagnosing appendicitis in children with acute abdominal pain showed: 246 patients with complaints of non-traumatic and non-recurrent acute abdominal pain were studied. All were between three and 18 years age. Of this patients with acute abdominal pain, both fever and vomiting were present in 18 of the 24 who eventually had diagnosis of appendicitis, compared with 49 of 222 patients with other final diagnosis. The duration of pain at presentation and the frequency of other symptoms (e.g., diarrhea, dysuria, anorexia, and lethargy) were unrelated, however, to final diagnosis, as was the duration of the pain and whether abdominal tenderness initially was localized or generalized. Non-rupture appendicitis was generally indistinguishable from ruptured appendicitis pre operatively by duration and symptoms. Boys were found more likely to have appendicitis (with or without rupture) than girls<sup>(23)</sup>.

In USA Boston 2002 a study reported acute appendicitis may be missed at initial clinical examination in 28%-57% of children aged 12years and younger and in nearly 100% of children under the age of 2years<sup>(24)</sup>.

In Czech Republic 1998 a study about the clinical picture of acute appendicitis in 3860children, showed that the highest incidence is between 8 and 11 years with a peak at the age of 10 years .It is more frequent in boys 58.3% than in girls 43.7%, the ratio being 1.3:1. It

occurs more often during the cold months 46.5%, in autumn 27.3% and in winter 25.7%. The number of gangrenous appendicitis is 34.7% –56.7% in boys and 43.5% in girls. The highest rate of missed appendicitis is at the age of 10 years 17.8% and in January 13.3%. The highest incidence of perforated is also at the age of 14.9% with the peak at the age of 8years 15.6% and in June 13.5%. Perforation is more frequent in boys 58.1% than in girls 49.9%. The number of negative appendicitis is 15.8%. Prevention of acute appendicitis still remains open due to lack of knowledge of its etiopathogenesis<sup>(25)</sup>.

In U.K 1998 a retrospective study about appendicitis over 12-month period in a sample of 101. The perforation rate was 7% in those children presenting with symptoms of 1 day or less and was significantly greater (33, chi 2=9.45, p< 0.01) in those who had had symptoms for more than 1 day at presentation. There was no difference in in-hospital delay between the groups. A high perforation rate was found to be a feature of delayed presentation<sup>(26)</sup>.

In Spain 1997 a group of 288 children between 9 months and 17 years of with acute appendicitis were studied over a 17-month period. They were divided into two age groups: Group I (< 5 years: n = 45) and Group II (5 or more years: n = 243). Comparisons between clinical, laboratory and radiological findings, appendiceal pathology, microbiology and complication were made. Children from Group I

showed a higher incidence of perforation 29% vs. 7.8 %, peritonitis 69% vs. 36%, appendiceal masses 37% vs. 10.2 %, positive cultures 66% vs. 18 % and complications 24% vs. 9.8 % than those from Group II. All differences were found to be significant ( $p < 0.05$ ). Children from Group I more frequently showed a set of clinical characteristics forming an atypical picture consisting of: 1) diffuse abdominal pain 69% vs. 30%; 2) associated infection with non-specific symptoms 33% vs. 11.5%; 3) Previous therapy with antimicrobial agent 40% vs. 9.8%; 4 ) X-ray findings compatible therapy with gastroenteritis 27% vs. 7.4%; and 5 ) Inability of the child to specify the intensity and location of pain<sup>(27)</sup>.

In Colorado 1997 a retrospective study about acute appendicitis in children in a community hospital: a five-year review. Cases were grouped as simple appendicitis, advanced appendicitis, and appendectomy without appendicitis. Variables considered included: length of symptoms at first contact, time from onset until surgery, presence or absence of classical symptoms, post-operative complications, length of hospital stay. They found that 64.6% had simple appendicitis while 27.9% of advanced disease, and 7.6% of normal appendix occurred. Advanced disease was high 66.7% in children less than 5, and low 22.7% in ages 10-14. Parental delay >48 hours in seeking care was a significant factor in advanced disease; professional delay (time from first exam until surgery) was not. Post-surgical complications occurred in 7 (31.8%) cases of advanced

disease and in none of the cases simple appendicitis. Advanced disease cases had an average hospital stay of 8.59 days (+/-2.92) vs. 3.86 days (+/-1.46) for simple appendicitis<sup>(28)</sup>

In USA 1997 a prospective study about incidence of acute non perforated and perforated appendicitis showed, the crude incidence of acute appendicitis was 86 per 100,000 per year. Although the incidence of non perforated appendicitis was highest among adolescents and young adults (13\_40 years of age), perforated appendicitis occurred at almost the same incidence in all sex and age groups<sup>(29)</sup>

In USA 1997 a retrospective study showed importance of diarrhea as a presenting symptom of appendicitis in very young children. Case series review was performed on all children under age 3 who had appendectomy for appendicitis between January 1983 and February 1994. Sixty-three children were identified. Mean age was 2.2 years (range 11 to 35 months). The mean delay from onset of symptoms to presentation was 4.3 day. Fifty-seven percent were initially misdiagnosed. Diarrhea was reported in 33%. Perforation and/or gangrene were found in 84%. Perforation and /or gangrene at laparotomy and history of diarrhea at perforation were independent predictors of prolonged hospital stay<sup>(30)</sup>

In Russian 1997 a study showed a new symptom of acute appendicitis in school –age children. In addition to the well- known classical symptoms of acute appendicitis he has revealed a characteristic

feature of the disease in 63.2 of children from 6 to 14 years of age. It is flexion and extension of the right foot toes during palpation of the right iliac area. The degree of the symptoms is proportional to the severity of inflammation of the vermiform process<sup>(31)</sup>.

In Italy 1994 a study showed current diagnostic- therapeutic trends in treatment of pediatric appendicitis. Emergency abdominal sonography has evolved in differential diagnosis of acute appendicitis in children to differentiate it from other causes of acute abdomen as mesenteric lymphadenitis, acute right pyelonephritis, acute right pyelonephritis acute diverticulitis in Meckel's diverticulum, intussusception, regional enteritis, primary peritonitis, anaphylactoid purpura of Henoch-Schonlein. Thirty-six patients were evaluated with abdominal sonography. This diagnostic tool showed in 34 (94.4) a liquid effusion, sometimes thick of the right iliac fossa. In 2 patients appendix had thickened layers was edematous and the lumen was clearly filled with debris. Abdominal sonography has given a clear cut picture of the acute inflammatory process of the appendix<sup>(32)</sup>.

A study in Chicago, USA 1998 showed the use of US did not result in early diagnosis of appendicitis nor, was it associated with a reduction in perforation or complication rates. Among children with clinical evidence of appendicitis, US was associated with a delay in surgery and increase in hospital charge<sup>(33)</sup>.

In U.S.A 1999 a study commuted topography with rectal contrast following a negative or indeterminate US result is highly accurate in the diagnosis of appendicitis in children<sup>(34)</sup>

In U.S.A 1993 a study about malrotation of the intestine showed that: more than half of the patients presented during the first month of life, and all had vomiting, which in most cases was bilious. The barium upper gastrointestinal series was the preferred diagnostic study, being both sensitive 95% and accurate 86%. In this series two-thirds of the patients presented with volvulus 68% of whom five had is ichemic intestine requiring resection. One of these children died of overwhelming sepsis<sup>(35)</sup>.

In Australia 1998 the risk factors of strangulation and obstruction in groin hernias in children, were very young age, male, short duration of hernia and the right side of hernia<sup>(36)</sup>.

In Norway 1998 a retrospective study about invagination in childhood. In 79 children (median age 7.5 month; 24 girls and 76 boys) showed that, at admission the diagnosis made by the referring physician could be confirmed in only about one-third of the cases. A barium enema was part of the in hospital diagnostic process. Non-operative treatment was attempted in 89% patients and barium enema reduction was successful in 64 patients. Laboratory was required in 42% of the patients.

No mortality, bowel perforation, or any other major complications were encountered<sup>(37)</sup>.

In U.S.A 1997 a study showed of 107 in patient children with intussusception. Fifty-six patients presented with grossly blood stool. Intussusception should be considered in the differential diagnosis of children passing any type of blood stool<sup>(38)</sup>.

A study In U.S.A 1998 addressed out come analyses of gastroschisis. Mode of delivery, method of closure, birth weight and gestational age, and the presence of intestinal atresia do not appear to correlate with survival in infants with gastroschisis<sup>(39)</sup>.

In U.S.A 1996 perinatal intussusception in premature infants was a report only in 12 cases. Many of the infants were believed to have necrotizing enterocolitis, leading to an average 12-day interval between the onset of signs and the operation<sup>(40)</sup>.

A Large study in Spain 1996 analysed the experience in neonatal surgery in 15-year period, with follow up of 1000 cases; pernatal diagnosis was made in 7.1%. The frequent entity was intestinal atresia 12.1%, followed by NEC in 7.9%, nevertheless the last was the most frequent finding in preterm newborns. Esophageal atresia was found in 5.6%. Association with other malformations was found in 12.6%, and 3.1% constituted congenital malformations syndromes<sup>(41)</sup>.

In Ireland 1999 congenital tracheoesophageal fistula with esophageal atresia (or an H type fistula) was studied. The clinical signs are mainly respiratory but also digestive and the symptomatology can be severe. Diagnosis can be made with a barium swallow combined with cineradiography, but a tracheoesophageal endoscopy remains the investigation of choice. Treatment is surgical<sup>(42)</sup>.

A study in Germany 1996 showed that most common sites of atresia in the GIT are the oesophagus, the duodenum and rectum. Surgical intervention is always necessary<sup>(43)</sup>.

In U.S.A 1996 a study about tethered cord and associated vertebral anomalies in children and infants with imperforate anus showed that, substantial number of patients with all types of imperforate anus have occult myelodysplasia that may necessitate surgical intervention. Including those patients with normal spine radiographs<sup>(44)</sup>.

In U.S.A 1996 a research group found that, the birth prevalence rate for spina bifida for the 16 states was 4.6 cases per 10,000 births. It was slightly higher among females than males<sup>(45)</sup>.

In China 1996 the incidence of neural system defects was 2.19 with hydrocephalus, anencephalus and spina bifida 0.89, 0.87, 0.36 respectively<sup>(46)</sup>.

In Netherlands 1996 they found the prevalence of spina bifida is at least 100 live-born children per year among 195,000 total births. Seventy-nine percent of children with spina bifida had myelomeningocele<sup>(47)</sup>.

In Tanzania 1977 analysis of admission to the Neonatal Unit during one year, shows that about 3% of the cases were surgical of which nearly two-thirds had congenital malformations in the head and neck, extremities and spine. Among the major common anomalies were spina bifida, poly-dactyl, and other musculo-skeletal malformation. It was an apparently lower incidence of most of the malformations in Dar es Salaam than elsewhere in the world<sup>(48)</sup>.

In Hamilton 1989 the commonest causes of deaths preoperatively and postoperatively in the neonate were, diaphragmatic hernia and NEC<sup>(49)</sup>.

In Memphis 1989 a study about NEC showed, there has been a significant decrease in the mortality of both medically and surgically treated infants with NEC; in both cases, this decrease is weight-dependent. Using erythema and edema of the abdominal wall and a fixed-loop roentgenographic pattern as early indicators of necrotic bowel significantly improves survival in surgically treated infants<sup>(50)</sup>.

In U.S.A a 25-year experience with 277 cases diagnosed as intestinal atresia and stenosis showed that: the level of obstruction was duodenal in 138 infants, jejunoileal in 128, and colonic in 21. Of the 277

neonates, 10 had obstruction in more than 1 side . Duodenal atresia was associated with prematurity in 46%, maternal polyhydramnios in 33%, Down syndrome in 24%, annular pancreas in 33%, malrotation in 28%. Jejunioileal atresia was associated with intrauterine volvulus in 27%, gastroschisis 16%, and meconium ileus 11.7%. Operative mortality for neonates with duodenal atresia was 4%, with jejunioileal atresia 0.8%, and with colonic atresia there was no mortality. The long-term survival rate for children with duodenal atresia was 86%, with jejunioileal atresia 84% and with colon atresia 100%<sup>(51)</sup>.

In U.S.A. a study about neonatal surgery showed, operative mortality is negligible in the good risk neonates (tumors, urology, orthopaedic and general surgery) but remains significant in the groups of serious malformations with high incidence of prematurity and associated anomalies. The present hospital mortality for patients with anorectal anomalies is about 5%, for spina bifida cystica about 10% and has even in oesophageal and duodenal atresia patients dropped to 15%. For other bowel atresias it is still 25% for gastroschisis and omphalocele around 35% and for diaphragmatic hernia 50%. Cardiac surgery, including perfusion operations, has become an integral part of neonatal surgery, its present mortality being around 35%<sup>(52)</sup>.

In Taiwan 2001, they found that small –bowel intussusception is often overlooked due to non specific clinical presentation including vomiting, abdominal pain, and or irritable crying<sup>(53)</sup>

In India 2001, the quality of neonatal surgical care and scientific publications are reliable yardsticks that were used to assess the status of pediatric surgery in India. . The mean newborn admission requiring surgical intervention per surgeon per year was 36 (17-80). The overall survival for esophageal atresia with or without tracheoesophageal fistula was 57.2% (30%-75), congenital diaphragmatic hernia 70.8% (40%-100%), anorectal malformations 90.4% (75%-100%), intestinal atresia 74.7% (30%-100%), and for abdominal-wall defects was 59.1% (0%-100%)<sup>(54)</sup>.

Study about evaluation of acute scrotum in the emergency department at Cincinnati in USA in 1995 showed that the incidences of testicular torsion of a testicular appendage, and epididymitis were 16%, 46%, and 35%, respectively<sup>(55)</sup>

In Israel 2001 a retrospective study about epididymitis in childhood showed: Epididymitis was diagnosed in 64.6% .The remaining` cases included torsion of the testis in 18.5%, torsion of the appendix testis in 7.7%, scrotal pain and minimal physical findings in 6.1%, and scrotal hematoma and idiopathic scrotal edema in one patient each<sup>(11)</sup>.

In U.S.A. A retrospective study compared the physical examination finding in patients with acute scrotum conditions. All patients with testicular torsion had a tender testicle and an absent cremasteric reflex. When compared with the testicular torsion group, fewer patients with epididymitis had a tender testicle 69% or an absent cremasteric reflex 14%. Ninety seven percent of patients with epididymitis had a tender epididymis and 67% had scrotal erythema/edema. By comparison, 23% and 38% patients with testicular torsion had a tender epididymis or scrotal erythema /edema, respectively<sup>(14)</sup>

In Italy 1997 a acute epididymitis was more common than testicular torsion. It is often quite difficult to find the origin of epididymitis in children with no genito-urinary anomalies; so the acute scrotum and in particular the epididymitis require an accurate physical exam, quickly feasible procedures and a prompt surgical exploration of the scrotum<sup>(56)</sup>

Another study also in Italy 1996 showed that causes of acute scrotum were, torsion of the appendix of testis (47%), torsion of testis (26%), acute orchiepididymitis<sup>(57)</sup>

A study group in Italy 1993 presented their experience reporting 457 consecutive cases of acute scrotum in 10 years. The condition is caused by torsion of the appendage of the testis (78.1), torsion of the funicle (9.6%), acute idiopathic edema of the scrotum (2.87%), and also tumors

(1.17%). The surgical approach is the correct treatment for the acute scrotum to prevent the irreversible damage of the testis<sup>(58)</sup>

In Missouri 1993 only 25% of boys with acute scrotal swelling have testicular torsion<sup>(59)</sup>.

In U.S.A. 1983 fifty-one children with acute scrotal pain and swelling underwent surgical exploration. Testicular torsion (27cases) and torsion of an appendage (18cases) were the most common diagnosis. In the group with testicular torsion 5 tests were considered unsalvageable and these were removed. The early salvage rate of 81% decreased to 50% due to testicular atrophy found in the late follow up period<sup>(60)</sup>

In Canada 1993 the majority (71%) of children with an acute scrotum did not require immediate surgical exploration. Color Doppler ultrasound can reliably identify those children with an acute scrotum who require exploration and spare the majority needless surgery<sup>(61)</sup> .

In Spain 1998 they found acute scrotum is an exceptional form of presentation of acute appendicitis in the pediatric age group<sup>(62)</sup> .

A French study in 2001 about the age for testicular torsion showed. Cases of torsion occurring during neonatal or pubertal were excluded. Eighty-six patients with acute scrotum symptoms underwent surgery. Twelve had true testicular torsion. The average age was five years<sup>(63)</sup> .

In Israel 2002 the average age of acute idiopathic scrotal edema in children was 6.2 years. No past history of allergy was elicited. Unilateral involvement predominated in 90%. None of the patients was found to have a primary source of scrotal, perianal, or perianal infection. Scrotal discomfort; scrotal, perineal, and inguinal swelling; and erythema were the most common findings. Treatment was conservative in 92%<sup>(64)</sup>

### **1-11.Experience in Sudan**

In Sudan a retrospective study done by Aziza Mustafa in 1998 of intestinal obstruction in 126 children and neonates. She found the most common cases of intestinal obstruction were found to be intussusception (22.2 %), adhesions and bands (19.05 %), anorectal malformations (16.7 %) and obstructed hernia was found in (14.2 %) of the cases. Good clinical evaluation remains an important part for the diagnosis, in (68.2 %) the diagnosis could be reached clinically. Few simple diagnostic aids were used for the confirmation of the diagnosis. Late presentation, lack of awareness among parents, paramedicals and some doctors led to increased morbidity and mortality<sup>(65)</sup>.

Another study done by Amir AbdAllah Hamza in 1998 about intussusception in 50 infants and children showed that: Infants were commonly affected (62 %) with (42 %) in the age group 4-6 months. He found the commonest symptoms signs were abdominal pain (84 %), vomiting (74 %), passage of blood stained stool or their detection per

rectum in (17 %), abdominal mass (58 %) and limb drawing in (46 %) dehydration was seen in (30 %), which was severe in (12 %) 6 patients. Forty five percent of patients with abdominal mass detected in the left lower quadrant (LLQ) had bowel gangrene. Thirty nine percent of patients presented within the first 48 hours, where as (33 %) presented 7 days or more from the commencement of their symptoms. Those who presented within the first two days, showed blood stained stool in (83 %), abdominal mass was detected in (72 %) and bowel gangrene in (11 %). Twenty six percent of patients were referred from other hospitals, after being hospitalized for a mean of 7 days<sup>(66)</sup>.

### **1.12. Accidental injuries:**

Accidental injury, especially among children, has the become one of the most serious major health problems facing developing countries<sup>(67)</sup>. Injury prevention is one of the most important preventive health challenges for pediatricians worldwide. A science of injury control has developed. Matching a child's skill and development age is needed for anticipatory guidance. Poor children living in rural areas are at greatest risk and require continuous reinforcement. Family education relates closely to injuries and recovery from injury. Prevention involves education, legislation, environmental modification, and engineering techniques<sup>(68)</sup>.

### **1.12.1.Head Injuries:**

Head injuries are a major cause of trauma mortality, morbidity, and disability in childhood. It is estimated that about 29% of all traumatic deaths in the pediatric population are due to head injury, a higher proportion than has been reported for all age groups combined<sup>(69)</sup>.

#### **1.12.1.1 Minor head injuries:**

Lacerations and contusions of the scalp are the most frequent head injuries seen in children. Either may occur following relatively minor accidents or may accompany more severe trauma. Lacerations should be irrigated and probed aseptically for the presence of foreign bodies prior to closure. The possibility of an underlying skull fracture should be considered. In addition to direct palpation of the wounded area, a skull roentgenogram may be necessary to rule out the existence of a fracture. The child's immunization status should be ascertained and guidelines for tetanus prophylaxis followed<sup>(70)</sup>.

Minor head injuries in children, even in the absence of laceration, concussion, or skull fracture, can lead to irritability, sleepiness, headache, or occasional vomiting following the accident. The pathogenesis of these symptoms is ill defined but

may be related to torisonal forces on the brainstem. These symptoms may persist for several days after the event<sup>(70-71)</sup>.

#### **1.12.1.2.Moderate head injuries:**

Cerebral concussion has been defined as the temporary unresponsiveness and loss of awareness that occur on impact. Although substantial forces are required, they may be insufficient to cause a fracture of the skull. The loss of consciousness is related to shearing and stretching forces transmitted to the brainstem as the brain itself is thrown back and forth within the cranial vault. The patient may be unconscious from a few seconds to several hours. Concussion occurs more often in acceleration/ deceleration-type injuries than in compressive-type injuries. The presence of amnesia is an indication that a concussion has occurred<sup>(72)</sup>.

Blunt trauma of sufficient force can cause bruising of the brain substance, or contusion, either as a result of a crush injury or during acceleration / deceleration of the brain within the cranium. The diagnosis of contusion is dependent on the demonstration of focal neurological signs or the appearance of focal seizures. It is confirmed by computerized tomography (CT) scan<sup>(70)</sup>.

#### **1.12.1.3. Skull fractures:**

Simple linear fractures require no specific treatment. Almost all will heal uneventfully. When accompanied by scalp laceration,

antibiotic prophylaxis should be part of the regimen. Patients with evidence of a basilar skull fracture should be admitted to the hospital for a minimum of 48 to 72 hours for observation. Radiographically; these fractures are rarely identified because of the complexity of the bony structures in the base of the skull. The diagnosis is made clinically by the presence of hemotympanum, Battle's sign, CSF otorrhea or rhinorrhea, bilateral orbital ecchymoses, or cranial nerve palsies. In decreasing order of frequency, the first, eighth, and seventh cranial nerves are the ones most commonly involved<sup>(70)</sup>.

Traditionally, patients with basilar skull fractures have been treated with prophylactic antibiotics. Recently, however, a series of patients was successfully managed expectantly, beginning antibiotics only when signs of infection were manifest. Most CSF leaks will close spontaneously within seven to ten days. Persistent leakage is an indication for surgical repair of the meninges<sup>(70)</sup>.

Depressed skull fractures are considered significant if a fragment of skull is depressed more than 5mm or lies below the inner table of bone as seen on a tangential film of the area. The depressed fragment should be elevated surgically; tears in the dura, identified and repaired where feasible; and antibiotic coverage, instituted<sup>(70)</sup>.

#### **1.12.1.4. Intracranial bleeding resulting from major head trauma:**

Significant intracranial injury can occur with or without fracture of the skull or immediate loss of consciousness. Whenever a patient's neurological status continues to deteriorate, the possibility of intracranial bleeding must be considered. Extra – axial collections of blood within the cranial vault are of two types: acute epidural hematoma, occurring outside the dura mater, and acute subdural hematoma, developing below the dura mater but above the piaarachnoid layers of the meninges. Both types occur more frequently in the supratentorial regions, with subdural hematomas being the more common<sup>(70)</sup>.

In infancy, the intracranial collection of blood and subsequent increases in intracranial pressure will cause bulging of the fontanelle, if present, and separation of the sutures. This may occur in children up to the age of 4 or 5, when fusion the sutures become complete. In older children, as intracranial pressure rises, the contents of the cranial vault are forced downward toward the only available opening, the foramen magnum. With unilateral epidural hematoma, there is most often transtentorial herniation of the temporal lobe, resulting in ipsilateral third nerve palsy, contra

lateral limb weakness, alterations of consciousness, and respiratory irregularities. Coma may ensue, with decorticate or decerebrate posturing and, ultimately, cardio respiratory arrest<sup>(70)</sup>.

#### **1.12.1.5.Cerebral edema:**

More commonly, bilateral transtentorial or central herniation is seen as a result of diffuse cerebral edema following the injury. Papillary constriction, decreasing level of consciousness, altered respirations, impaired upward gaze, hyper tonicity, and decorticate posturing should alert the clinician to this possibility. As with uncal herniation, deterioration of the patient's clinical status, with papillary dilatation, decerebrate posturing, and cardio respiratory arrest, may occur rapidly<sup>(70)</sup>.

#### **1.12.1.6.Management:**

CT scan is an essential part for evaluation and management of patients with intra cranial injury. Medical management is by fluid restriction. Since over dehydration can lead to an increase in cerebral edema. Hyper ventilation by mechanical ventilation reducing PCO<sub>2</sub> to 25 to 28 torr, will decrease cerebral blood flow rapidly and can be sustained to lower intra cranial pressure without the attendant risk of potentiating intra cranial bleeding. I.V osmotic agents such as mannitol or glycerol may be used acutely

to lower intra cranial pressure. Dexamethasone has controversial action. Control or prophylaxis for seizures should be achieved<sup>(70)</sup>.

### **1.12.2. Thoracic Injuries:**

Thoracic injuries are un common in children. As such, they can cause a great deal of anxiety among parents and physicians. In fact, the great majority of these injuries are appropriately and safely managed with expectant observation done or with in situation of inter costal tube drainage for air or blood. Only the rare patient will require urgent thoracotomy for immediately life-threatening situations<sup>(73)</sup>.

### **1.12.3. Abdominal Injuries:**

A significant number of deaths in children result from blunt abdominal trauma<sup>(70)</sup>.

#### **1.12.3.1 Liver injuries:**

Liver injury is second only to head trauma as the cause of death following injury. Although partially protected by the rib cage, the liver is nonetheless vulnerable to injury due to its large size and the fragility of its tissue<sup>(70)</sup>.

#### **1.12.3.2. Spleen injuries:**

Spleen is the most commonly injured organ following blunt abdominal trauma, which as at least partly attributable to its rich

vascularity<sup>(74)</sup>. The most common physical finding is L.U.Q. tenderness, occasionally with referred pain to the shoulder (Kehr's sign), caused by diaphragmatic irritation<sup>(70)</sup>.

C.T. scan can demonstrate trauma of the liver, spleen, pancreas, kidney, and other commonly injured organs in blunt abdominal trauma. A base line U/S should also be obtained as early as possible following trauma<sup>(70-74)</sup>.

Treatment is by early resuscitation. Avoid I.V infusion of the lower extremities in liver trauma because there is possibility of inferior vena cava injury. Conservative management is the role, when the child had stable vital signs or no evidence of continued intra abdominal hemorrhage. Immediate laboratory down to any child with unstable vital signs and have intra peritoneal hemorrhage<sup>(70)</sup>

### **1.13.Burns**

Thermal injury is a major cause of accidental death and disfigurement in children pain, morbidity, the association with child abuse, and the preventable nature of burns constitute an area of major concern in pediatrics. Common causes include hot water or food, appliances, flames, grills, vehicle-related burns, and curling irons. Burn occur commonly in toddlers – in boys more frequently than girls<sup>(75)</sup>.

### **Classification of burns:**

Proper triage and treatment of burn injury require assessment of the extent and depth of the injury. Burn classified into first-degree burns, second-degree burn: superficial and mid level to deep second-degree burns. Full – thickness or third degree burns<sup>(76)</sup>. Estimation of body surface area of burn, by using surface area chart such as Lund and Browder modification of Berkow's scale<sup>(75)</sup>.

### **Treatment:**

Out patient management require of minor burns. Major burn place particular importance on the ABCS of trauma management. Use colloid replacement concurrently if the burn is greater than 85% total BSA. Controversy exists over the prophylactic use of penicillin for all acute hospitalized burn patients. Deep second-degree burns greater than 10% BSA benefit from early tangential excision and grafting<sup>(75-76)</sup>.

### **1.14. Global experience:**

In Ghana 1998 a hospital based study of 677 cases showed, the most common mechanisms of injury were pedestrian knockdowns 4%, falls 27.2%, and burn 17.6%. Boys sustained higher injury rates in all age groups than girls. In severe injuries the most suffered region were the extremities, followed by the skin and head<sup>(67)</sup>

In Germany a retrospective comparison between pediatric, adolescent and adult polytrauma showed, children younger than 6 years had the most severe head injuries. In all groups injuries to the head and the legs were most common. Children showed a lower incidence of trauma to the thorax, abdomen, hip and arms than the adult group<sup>(77)</sup>.

In United Arab Emirates 1998, the most common cause of accidental death was RTA followed by drowning and burn. Most mortality occurred in the age 1-4yr. Head and neck injury was the major type of injury causing death. Pediatric trauma cases seen during the duration of study (1yr), representing one third of all patients attending the Hospital Emergency Room. About 70% of encountered injuries occurred among boys. The most common trauma was contusion. R.T.A mainly occurred in children over 5yrs. In the age group <5yrs the most common causes of trauma were burn, fall and blunt trauma respectively<sup>(78)</sup>.

In Finland blunt injuries were the most common childhood trauma followed by penetrating injuries, burns and others. The majority of all injuries and deaths in children were caused by R.T.A. All the trauma deaths occurred immediately or within a few days of the accident. Late trauma deaths due to sepsis or multiple organ failure were not seen in children<sup>(79)</sup>.

In Nigeria the most common causal factor, responsible for injuries were falls, misplaced foreign body, bites with dog and snake, burn,

mainly from scalding, knife wounds, and gunshot wound respectively. More males were affected than females. The most common anatomic region affected was the head and neck followed by the limbs<sup>(80)</sup>.

In Spain loss of consciousness, amnesia, GCS less than 15 and focal neurological deficits were significantly more common in the group with intra cranial injury. These patients should undergo head Ct because a small number will require surgery. After a minor head trauma children who are neurologically normal and without symptoms may be discharged from the ED and sent home after careful physical examination<sup>(81)</sup>.

In South Africa they found children with a presenting coma score of less than 8 have extremely poor mortality and morbidity rate, despite modern intensive care preventive strategies are essential<sup>(82)</sup>.

In Germany 1998 a study about GIT perforation due to blunt trauma showed. The presence of multiple perforations correlated significantly with the earlier development of clinical signs of peritonitis<sup>(83)</sup>.

In U.S.A 1993 falls accounted for nearly one third of all trauma admission, and fall patients tended to be younger than those with other injuries. Falls from one level to another accounted for 40% of the total on fourth of all patients and 42% of preschoolers sustained head injury. The annual case of these injuries in washing state was \$4.5 million<sup>(84)</sup>.

In Czech– Republic the mortality of severely burned children hospitalized in I.C.U., found no child died from shock during the early post burn period. Five children who died suffered deep burns greater than 50% TBSA and at necropsy then were identified signs of multiple organ system failure which was related to infection<sup>(85)</sup>.

In Brazil fifty percent of burn-injured children were under 3yrs age, and had suffered a scald. The kitchen and backyard were identified as the places where the majority of accidents 84.6% happened. At least one parents was present in 80.7 of cases<sup>(86)</sup>.

In Iran 1998 the most common cause of burn in children was boiling water. The highest Rate of burns was observed among illiterate people. The mean length of hospitalization was 12 days. Sixty three percent of patients were male and 37% were female<sup>(87)</sup>.

In Portugal a retrospective study showed: forty two percent of all burn patients were children under 15yrs old. The majority were male 60%. The frequent etiological agent was caused by fire 44% and scalded 39%. About 74 of all patients required surgical treatment. The average hospital stay was 27.2 days. The overall mortality was nearly 68%<sup>(88)</sup>.

In U.K. burns comprised about 1 percent of the workload in the emergency departments. Children under five had the highest rate of admission. The median length of stay was 6 days for burn units<sup>(89)</sup>.

In Nepal 1998 the majorities of burns occurred at home and were largely preventable. Sixty one percent of burn patients were children under 15 yrs of age. There were more female patients and female had more severe burns. No patients with greater than 40% BSA burns of any age group survived<sup>(90)</sup>.

In U.S.A treatment of seriously burned infant (more than 30%) was studied. They approached a strategy that emphasizes precise fluid repletion; early excision and biologic closure of wounds; avoidance of ventilator-induced lung injury; and intensive nutritional support. All children survived and discharge home<sup>(91)</sup>.

In U.S.A 1998 injuries related to trampolines were studied. The median age of injured children was 10 years, and 50% were males. Ninety-three percent of injuries occurred at home. Injuries to the extremities predominated among children of all age and accounted for more than 70% of all injuries. These injuries had also resulted in death<sup>(92)</sup>.

In U.S.A neurological injuries represented 18% of all pediatric injuries and accounted for 23% off all traumatic deaths. Spinal cord and peripheral nerve injuries were rare (5%) compared to head injuries (95%). Minor head injuries accounted for the majority of neurological injuries (76%). Traffic accidents and falls were the leading causes (38% and 34%, respectively)<sup>(93)</sup>.

In U.S.A children undergoing emergency department work-up of occult (minor) head injury, whom had a normal CNS exam and a normal head CT scan, do not seem to be at risk for significant CNS sequelae. These patients can be discharged home with parental supervision and avoid unnecessary and costly hospitalization<sup>(94)</sup>.

In Sudan O. M. Ismail in 1994 studied pattern and management of pediatric burns in Khartoum teaching hospital. In this study toddlers 50% were found to be the commonest affected group by burn injuries and males predominate females. Most of the burned children live in poor housing conditions and all of the accident recoccurred in the present of their mothers. Scalds were found to be the commonest cause of burn injury (71.42%) followed by flames (19.04) exposure-drying method was used for all patents with physiotherapy. It was of low cost and associated with low infection rate and a short hospital stay. Wound swab for cultures and use of proper antibiotics and early discharge were the rule<sup>(95)</sup>.

**Justification:**

- Pediatric surgical emergencies cause significant morbidity and mortality.
- Accurate and early diagnosis at presentation could prevent many of complications and mortality.
- Lack of coordination between pediatric and surgery units accounts for delays in referral and management.

**Objectives:**

1. To study the clinical presentation, referral and management of pediatric surgical emergencies presenting to the pediatric casualty.
2. To assess the pre-operative care offered to the child with suspected surgical problem.
3. To evaluate the referral system of the surgical cases.

## **CHAPTER TWO**

### **2. Material and Methods:**

#### **2.1 Study design:**

Prospective descriptive cross sectional hospital based study.

#### **2.2 Study area:**

The study was conducted at four major hospitals:

- Khartoum teaching hospital; pediatric surgery, orthopedic &traumatology departments.
- El shaab educational hospital; neuro surgical department.
- Omdurman teaching hospital; pediatric surgical department.
- Khartoum-North teaching hospital; pediatric surgical department.

#### **2.3 Study period:**

The data was collected from April –November 2004.

#### **2.4 Study population:**

Study included all children presenting to the casualty of these hospitals, and who were continued to be emergency surgical problems.

### **2.4.1 Inclusion criteria:**

- Children under eighteen years.
- Presentations to these hospitals with emergency surgical problems include acute abdomen, acute scrotum, neonatal emergencies, accidental injuries and burn.
- Children present directly or referred to the surgical units.

### **2.4.2 Exclusion criteria:**

- Children with non-surgical emergency problems.
- Children with elective surgical problems.

## **2.5 Sample:**

### **2.5.1 Sample size:**

$$N = \frac{Z^2 \times P \times Q}{D^2}$$

Where

$N$ = sample size

$Z$ = confidence interval

$P$ = prevalence = 0.10

$$Q = 1 - P = 1 - 0.10 = 0.90$$

$D =$  desired marginal of error = 0.05

$$N = \frac{1.96^2 \times 0.10 \times 0.90}{0.05^2} = 136$$

### **2.5.2 Sample technique:**

Sample included all children examined by the author at presentation and before surgery interference.

## **2.6 Research tools:**

### **2.6.1 Questionnaire:**

The questionnaire was designed as follows: personal data, clinical presentation, source of refer. Detailed information about the child referral from the pediatric casualty, duration of stay, provisional diagnosis and management. Evaluation of the referral system. Finally at the surgery casualty management, final diagnosis, and outcome.

### **2.6.2 Physical examination:**

A physical examination was performed by the author in every child including checking vital signs and system examination.

## **2.7 Statistical analysis:**

The results were analyzed using the computer program SPSS (Statistical Package for Social Sciences). The  $\chi^2$  test is used for the differences in proportion. P.Value of less than 0.05 was regarded statistically significant.

## **2.8 Research team:**

The research team included managing doctors and a statistician. The author attended the casualty days and examined each patient and fills the questionnaire before operation. The author followed the patients until discharge or otherwise.

## **2.9 Ethical consideration:**

A verbal consent was taken from the administrator of the emergency hospitals, treating doctors and parent of each child

## **2.10 Funds:**

The author supplies fund.

## **2.11 Obstacles:**

Refusal of the parent to give consent.

## **Chapter Three**

### **Result**

#### **3.1 Personal data of the study population:**

##### **3.1.1 Gender distribution of the study population:**

A total of 136 children presenting with pediatric surgical emergencies were studied, 81(59.6%) were males, where 55(40.4%) were females. The male to female ratio was 1.4:1 as shown in (Fig.1).

##### **3.1.2 Age distribution of the study population:**

A total of 35 (25.7%) of studied children recorded for the newborns. 1month <1year were 11(8.1%) of studied children. Thirty (22.1%) were less than 5 years, 28(20.6%) were aged  $5 \leq 10$  years. Children more than 10 years were 32(23.5%) as shown in (Table.1).

##### **3.1.3 Distribution of the study population according to area of the residence:**

The majority of studied children were from the peri-urban area, which accounted for 63 (46.3%) of children, 53 (39.0%) of studied children were from rural area. Only 20(14.7%) from urban area.

## **3.2 Clinical presentation of study population:**

### **3.2.1 Duration of symptoms before presentation to the surgical casualty:**

Seventy seven children (56.6%) presented during 24 hour of their complain. After  $24 \leq 48$  hour presented 23 (16.9%) child. Thirteen (9.6%) presented during  $48 \leq 72$ hour. Twenty three(16.6%) children presented after 72 hour.

### **3.2.2 Distribution of the study population according to the diagnoses:**

Table 2 : show that 37 children (27.2%) presented with appendicitis. Acute appendicitis accounted for 19(14.0%). Perforated appendix accounted for 18(13.2%). Accidental injuries were the second emergencies group accounted for 33 (24.2%) of admission. Intestinal obstruction was the third common group accounted for 31(22.8%). Intussusception was the commonest cause of intestinal obstruction accounted for 14 (45.2%). Other causes of intestinal obstruction were intestinal atresia 8(25.7%), adhesions and bands 6(19.3%), and volvuls 3(9.8%), as shown in (Fig.2 ).

### **3.2.3 Distribution of newborns according to diagnosis:**

Thirty-five newborns were studied. Hydrocephalus with meningomyelocele was the commonest surgical emergencies in newborns 12 (34.3%). Intestinal atresia diagnosed in 8(22.8%). Imperforate anus accounted for 7(20.0%). Exomphalos accounted for 5(14.3%). T.O.F&O.A diagnosed in 2(5.7%). Only 1 neonate (2.9%) presented with congenital diaphragmatic hernia as shown in (Table.3).

### **3.2.4 Diagnosis and distribution of gender:**

Males were the commonest affected group in acute appendicitis, perforated appendix, accidental injuries, imperforate anus, strangulated umbilical hernia and exomphalos.

Females were the commonest affected group only in intestinal Obstruction. Males equal females in intussusception hydrocephalus with meningomyelocele and burns.

This show in (Table.4).P-Value .735 Chi square 8.624. This result statistically insignificant.

### **3.2.5 Diagnosis and distribution of age:**

The highest incidence of acute appendicitis was between 5-10 years diagnosed in 10 (52.6%). No cases reported in the age group less than 5 years. Perforated appendicitis had a highest incidence above the 10

years account for 10 (55.6%) of the patients. In the age group 1<5 years diagnosed 6(33.3%).

Intestinal Obstruction had a highest incidence in the newborns diagnosed in 8 (47.1%) of the patients. Intussusception had a highest incidence in the age group 1 month to 1 year 11 diagnosed in (78.6%). Burn had a highest incidence in the age group 1<5 years diagnosed in 15(83.3%). Accidental injuries had a highest incidence in the age group 5<10 years diagnosed 8(53.3%). Strangulated umbilical hernia all the patients presented in age group 1-5years.

This show in (Table.5).P-Value .0001 Chi square 287.07. This result statistically significant.

### **3.2.6 Presenting symptoms and signs of acute appendicitis:**

Abdominal pain was the cardinal symptom of acute appendicitis. All the patients had abdominal pain 19 (100%). Fever reported in 11 (57.6%) and vomiting reported in 9 (47.4%).

**Abdominal tenderness** was the main sign of acute appendicitis. Eighteen (94.7%) presented with abdominal tenderness. Rebound tenderness reported in 16(84.2%) and guarding in 9(47.4) as shown in (Table.6).

### **3.2.7 Presenting symptoms and signs of perforated appendix:**

Abdominal pain was the cardinal symptom of perforated appendicitis. All the patients had abdominal pain 18 (100%). Anorexia in 14(77.8), vomiting reported in 13 (72.2%), and fever reported in 9 (50.0%).

Abdominal tenderness was the main sign of perforated appendicitis. Seventeen (94.4%) presented with abdominal tenderness. Rebound tenderness reported in 15(83.3%), guarding in 6(47.4) as shown in (Table.7).

### **3.2.8 Presenting symptoms and signs of intestinal obstruction:**

Table 8 show clinical presentation of intestinal obstruction. Vomiting was the cardinal symptom of intestinal obstruction, reported in 16 (94.1%). Then abdominal pain and constipation each of them reported in 10(58,8%). Fever accounted in 9(52.9%).

Abdominal distension was the main sign of intestinal obstruction reported in 16(94.1%). Then abdominal tenderness accounted in 10(58.8%), and visible loops in 7(41.2%).

### **3.2.9 Presenting symptoms and signs of intussusception:**

Abdominal pain and vomiting were the cardinal symptoms of intussusception. All of the patients diagnosed as intussusception had abdominal pain and vomiting 14(100%). Bloody diarrhea was the third symptom accounted for 12(85.7%).

Abdominal distension accounted for 11(78.6%), peristaltic waves in 8(57.1%) and abdominal mass in 5(35.7%). All the patients presented with dehydration and 3 (21.4%) were severely dehydrated as shown in (Table.9).

### **3.2.10 Accidental injuries according to the cases:**

Thirty-three children presented with accidental injuries. Burn was the commonest cause of injuries presented to the emergency units accounted for 18(54.5%). R.T.A accounted in 10 (30.3%), fall down in 4 (12.1%) and trauma by sharp object reported only in 1(3.0%) as shown in (Fig.3).

### **3.2.11 Trauma according to affected site:**

Head and neck were the commonest affected sites, reported in 8 patient and equal to 53.3% of total effected sides. Abdomen affected in 7(46.7), extremities effected in 6(40.0%). Two (13.3%) patients presented

with trauma to the chest. (%) Children presented with trauma to more than one side. This shown in (Fig.4).

### **3.2.12 Burn according to the BSA:**

The majority of burns were between 10-20% of BSA, occurring in 14(77.8%). Four (22.2%) cases reported less than 10%. There were no cases reported more than 20% of BSA as show in (Fig.5).

Scald was the common cause of burn. It reported in 16(88.9%). Flame was the other cause reported in only 2(11.1%).

### **3.3 Referral system:**

#### **3.3.1 Study population according to the referral sources to the surgery:**

One hundred thirty six children were studied. The majority of children 96(70%) were referred from pediatric emergency units to surgical emergency units. General practitioner referred 17(12.5%). Fifteen children (11.0%) presented directly to the surgical emergency units and all of them were due to accidental injuries as shown in (Table.10).

### **3.3.2 Consultations seen before referring to surgery units**

#### **during this illness:**

One hundred (73.5%) presented to the surgery unit for the first time. Twenty (14.7) children had one medical consultation, while nine (6.6%) had two. Three medical consultations obtained for 3 (2.2%). Four children had four or more (2.9%) as shown in (Fig.6). These medical consultations were in different health units. Twenty-one (58.3%) had previous consultation in health centers; while 7 (19.4%) seek medical consultation at paediatric casualty. General practitioners saw 8 (22.2%).

The pervious diagnoses were malaria in 17 (47.2%). G.E were diagnoses in 15 (41.7%). Others diagnose 4(11.1%) such as U.T.I.

### **3.3.3 Service to children in the pediatric emergency units:**

First line doctors were house officers 74 (77.1%) and registrars 22 (22.9%) as shown in (Table.11).

Pediatric registrar saw 39 (40.6%) during 10 min, 45 (46.9%) during 10 to 30 min, 7 (7.3%) during 30 to 60 min and 5 (5.2) in more than 60 min as shown in (Table.12).

The pediatric consultants were informed about 62 (64.6%) of 96 referred children. They saw 38 (61.3%) of them as shown in (Table.13).

Forty-nine children (51.0%) were referred immediately to the surgical units. During 24 hour 18(18.8%) were referred. Nineteen (19.8%) children were referred during 24-48 hour. Seven (7.3%) children were referred during 48-72 hour. Three (3.1%) were referred after been admitted more than 3 days as shown in (Table.14).

### **3.3.4 Mode of transportation:**

An ambulance only transported 18(13.2%) of the study population. Resuscitation equipments were available in 18(13.2) during transportation as shown in (Fig.7).

Total children referred to surgery units were 121. Methods of referral were accompanying doctor and referral sheet for 35(28.9%). Eighty-one children (66.9%) referred with referral sheet no house officers accompanying. Five (4.1%) were referred verbally. No child was referred with nurse as shown in (Table.15).

During 30 min 67(55.8%) of children arrived surgery casualty. Thirty (25.0%) arrived during 30-60 min. The reminder 24(19.2%) arrived in more than 1hour as shown in (Fig.8).

### **3.4 Services to referred children in the surgery emergency**

#### **units:**

The first line doctors were house officers in 103(75.7%), medical officers in 25(18.4%) and registrars in 8(5.9%) as shown in (Fig.9).

Registrar or medical officer saw 16(11,8%) during 10 min, 46 (33.8%) during 10 to 30 min, 41 (30.i%) during 30 to 60 min and 33 (24.3%) in more than 60 min as shown in (Fig.10).

Consultant surgeon was notified in 111(81.6%) and saw 110(80.8) as shown in (Fig.11.12).

Ninety-eight children (72.15%) of the total study population needed operative treatment. Conservative treatment need in 38(27.9%) as shown in (Fig.13). Authorization by consultant surgeon given in 86(87.8%), personal in 74 (86.0%) and by phone in 12 (14.0%)

Management received by children were N.P.O for 112(82.4%), I.V fluids for 127 (93.4%), antibiotics for 128 (94.1%), suction and replacement for 66 (48.5%), honey bee for burns 18 (13.2%) and chest tube in 2 (1.5%) as shown in (Table.16).

Immediate post operative care was in I.C.U for 24 (17.6%) and in the ward for others 112(82.4%) as shown in (Fig.14).

Duration of stay in hospital 42 (30.9%) stayed for 1 week or less, 39 (28.7%) stayed from 1 to 2 weeks, 27 (19.9%) stayed for 2 to 3 weeks,

27 (19.9%) stayed for 3 to 4 weeks and 1 (0.7%) stayed more than 4 weeks as shown in (Fig.15).

### **3.5 Outcome of study population:**

Out come of study population 123 (90%) discharge and 13 (9.6%) died as shown in (Fig.16).

#### **3.5.1 Duration of symptoms before presentation to the surgery emergency units and outcome:**

Seventy seven children presented during 24 hour of their complain, 70(56.9%) were discharge and 7(9.1%) died. From  $24 \leq 48$  hour there were 23 child, 22(95.7%) were discharge and 1(8.3%) died Thirteen presented during  $48 \leq 72$ hour, 11(84.6%) were discharge and 2(15.4%) died. More than 72 hour presented 23 children (87%) discharge and 3(13%) died. Statistically the difference is not significant Chi squire 1.084 P-Value .781 as shown in (Table.17).

#### **3.5.2 Time until the pediatric registrar saw the child and outcome:**

Total numbers of children referred from paediatric casualty to surgery casualty were 96. Pediatric registrar saw 39 during 10 min, 37 (94.9%) were discharge and 2(5.1%) died. He saw 45 children

during 10 to 30 min, 42 (95.5) were discharge and 3 (4.5%) died. Seven children were seen during 30 to 60 min, 3 (42.9) were discharge and 4 (57.1) died. In more than 60 min paediatric registrar saw 5 children, 3 (60%) were discharge and 2(40%) died. This result is statistically significant. Chi square 20.97 P-Value 0.0001 as shown in (Table.18).

### **3.5.3Duration until registrar or medical officer saw the child at the surgery emergency units and outcome:**

Total of 136 children were seen in surgery casualty. Registrar or medical officer saw 16 during 10 min, 13 (81.2%) were discharge and 3 (18.8%) died. He saw 46 children during 10 to 30 min, 44(95.7%) were discharge and 2 (4.3%) died. Forty-one children were seen during 30 to 60 min, 38 (92.7%) were discharge and 3 (7.3%) died. In more than 60 min surgery registrar saw 33children, 28 (84.8%) were discharge and 5(15.2%) died. This result is statistically insignificant. Chi square 4.44. P-Value 0.2176 as shown in (Table.19).

### **3.5.4 Duration of stay in pediatric emergency units until referral and outcome:**

Forty-nine children were referred immediately to surgery units, 47(95.9%) were discharge and 2(4.1%) died. During 24 hour 18 were referred, 16(88.9%) were discharge and 2(11.1%) died. Nineteen children were referred during 24-48 hour 17(89.5%) were discharge and 2(10.5%) died. Seven children were referred during 48-72 hour 4(57.1%) were discharge and 3(42.9%) died. Three (3.1%) were referred after been admitted more than 3 days 2(66.7%) were discharge and 1(33.3%) died. This result is statistically significant. Chi square 18.462 P-Value 0.001 as shown in (Table.20).

### **3.5.5 Mode of transportation and outcome:**

An ambulance transported 18(13.2%) of the study population. The final out come 14(77.8%) were discharge and 4(22.2%) died. Children not transport by an ambulance were 118(86.8%), final out come 111(94.1%) were discharge and 7(5.9%) died. This result is statistically significant. Chi square 3.72 P-Value 0.05 as shown in (Table.21).

### **3.5.6 Diagnosis and outcome:**

Thirteen children (9.6) died of the study population. No deaths reported for acute appendicitis, perforated appendix, burn, strangulated umbilical

hernia, imperforated anus, and epididymitis. Three cases (17.6%) of 18 cases diagnosed as intestinal obstruction died, which equal to (23.1%) of total deaths. Two cases (14.3%) of 14 cases diagnosed as intussusception died, which equal to (15.4%) of total deaths. Two cases (13.3%) of 15 cases diagnosed as trauma died, which equal to (15.4%) of total deaths. One case (8.3%) of 12 cases diagnosed as hydrocephalus and meningomyelocele died, which equal to (7.7%) of total deaths. Two cases (40%) of 5 cases diagnosed as exomphalos died, which equal to (15.4%) of total deaths. Two cases (100%) diagnosed as T.O.F&O.A died, which equal to (15.4%) of total deaths. One case (100%) diagnosed as congenital diaphragmatic hernia died, which equal to (7.7%) of total deaths. This result is statistically significant Chi square 43.059 P.Value 0.001 as shown in (Table.22).

**Table (1):**

**Distribution of the study population according to age**

<b>Age</b>	<b>No</b>	<b>%</b>
<b>Newborns</b>	35	25.7
<b>1m&lt;1yr</b>	11	8.1
<b>1≤5yrs</b>	30	22.1
<b>5≤10ys</b>	28	20.6
<b>More than 10ys</b>	32	23.5
<b>Total</b>	<b>136</b>	<b>100</b>

**Table (2):**

**Distribution of the study population according to the diagnosis**

<b>Disease</b>	<b>No</b>	<b>%</b>
<b>Acute appendicitis</b>	19	14.0
<b>Perforated appendix</b>	18	13.2
<b>Burn</b>	18	13.2
<b>Intestinal Obstruction</b>	17	12.5
<b>Intussusception</b>	14	10.3
<b>Trauma</b>	15	11.0
<b>Hydrocephalus &amp; Meningomyelocele</b>	12	8.8
<b>Strangulated umbilical hernia</b>	6	4.4
<b>Exomphalos</b>	5	3.7
<b>Imperforate anus</b>	7	5.1
<b>T.O.F&amp;O.A</b>	2	1.5
<b>Epididymitis</b>	2	1.5
<b>Congenital diaphragmatic hernia</b>	1	0.7
<b>Total</b>	<b>136</b>	<b>100</b>

**Table (3):**

**Distribution of the newborns to the diagnosis:**

<b>Disease</b>	<b>No</b>	<b>%</b>
<b>Hydrocephalus &amp; Meningomyelocele</b>	12	34.3
<b>Intestinal atresia</b>	8	22.8
<b>Exomphalos</b>	7	20
<b>Imperforate anus</b>	5	14.3
<b>T.O.F&amp;O.A</b>	2	5.7
<b>Congenital diaphragmatic hernia</b>	1	2.9
<b>Total</b>	<b>35</b>	<b>100</b>

**Table (4):**

**Distribution of study group by gender& diagnosis**

<b>Diagnosis</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>Acute appendicitis</b>	13(68.4%)	6(31.6%)	19(100%)
<b>Perforated appendix</b>	11(61.1%)	7(38.9%)	18(100%)
<b>Burn</b>	9(50%)	9(50%)	18(100%)
<b>Intestinal Obstruction</b>	8(47.1%)	9(52.9%)	17(100%)
<b>Trauma</b>	9(60.0%)	6(40.0%)	15(100%)
<b>Intussusception</b>	7(50.0%)	7(50.0%)	14(100%)
<b>Hydrocephalus&amp; Meningomyelocele</b>	6(50.0%)	6(50.0%)	12(100%)
<b>Imperforate anus</b>	5(71.4%)	2(28.6%)	7(100%)
<b>Strangulated umbilical hernia</b>	5(83.3%)	1(16.7%)	6(100%)
<b>Exomphalos</b>	3(60.0%)	2(40.0%)	5(100%)
<b>T.O.F&amp;O.A</b>	2(100.0%)	-	2(100%)
<b>Epididymitis</b>	2(100.0%)	-	2(100%)
<b>Congenital diaphragmatic hernia</b>	1(100.0%)	-	1(100%)
<b>Total</b>	<b>81(59.6%)</b>	<b>55(40.4%)</b>	<b>136(100.0%)</b>

**$X^2 = 8.624$**

**P-Value = 0.735**

**Table (5):**

**Distribution of study group by age& diagnosis**

<b>Diagnosis</b>	<b>Newborns</b>	<b>1m&lt;1</b>	<b>1 ≤ 5yrs</b>	<b>5 ≤ 10ys</b>	<b>&gt;10</b>	<b>Total</b>
<b>Acute appendicitis</b>	-	-	-	10(52.6%)	9(47.4%)	19(100%)
<b>Perforated appendix</b>	-	-	6(33.3%)	2(11.1%)	10(55.6%)	18(100.0%)
<b>Burn</b>	-	-	15(83.3%)	2(11.1%)	1(5.6%)	18(100%)
<b>Intestinal Obstruction</b>	8(47.1%)	-	3(17.6%)	2(11.8%)	4(23.5%)	17(100%)
<b>Trauma</b>	-	-	1(6.7%)	8(53.3%)	6(40.0%)	15(100%)
<b>Intussusception</b>	-	11(78.6%)	1(7.1%)	2(14.3%)	-	14(100%)
<b>Hydrocephalus&amp; Meningomyelocele</b>	12(100.0%)	-	-	-	-	12(100%)
<b>Imperforate anus</b>	7(100.0%)	-	-	-	-	7(100%)
<b>Strangulated umbilical hernia</b>	-	-	6(100.0%)	-	-	6(100%)
<b>Exomphalos</b>	5(100.0%)	-	-	-	-	5(100%)
<b>T.O.F&amp;O.A</b>	2(100.0%)	-	-	-	-	2(100%)
<b>Epididymitis</b>	-	-	1(50.0%)	-	1(50.0%)	2(100%)
<b>Congenital diaphragmatic hernia</b>	1(100.0%)	-	-	-	-	1(100%)
<b>Total</b>	<b>35</b>	<b>11</b>	<b>33</b>	<b>26</b>	<b>31</b>	<b>136</b>

$$X^2 = 287.074$$

P-Value = 0.0001

**Table (6):**

**Presenting symptoms and signs of acute appendicitis**

<b>S&amp;S</b>	<b>No</b>	<b>%</b>
<b>Abdominal pain</b>	19	100.0
<b>Vomiting</b>	9	47.4
<b>Fever</b>	11	57.9
<b>Anorexia</b>	6	31.6
<b>Nausea</b>	7	36.8
<b>Diarrhea</b>	1	5.3
<b>Distension</b>	5	26.3
<b>Tenderness</b>	18	94.7
<b>Rebound tenderness</b>	16	84.2
<b>Guarding</b>	9	47.4
<b>Rigidity</b>	0	0.0
<b>Psoass sign</b>	8	42.1
<b>Obturator sign</b>	3	15.8

**Table (7):**

**Presenting symptoms and signs of perforated  
appendicitis**

<b>S&amp;S</b>	<b>No</b>	<b>%</b>
<b>Abdominal pain</b>	18	100.0
<b>Vomiting</b>	13	72.2
<b>Fever</b>	9	50.0
<b>Anorexia</b>	14	77.8
<b>Nausea</b>	9	50.0
<b>Diarrhea</b>	7	38.9
<b>Distension</b>	3	16.7
<b>Tenderness</b>	17	94.4
<b>Rebound tenderness</b>	15	83.3
<b>Guarding</b>	6	33.3
<b>Rigidity</b>	5	27.8
<b>Psoass sign</b>	5	27.8
<b>Obturator sign</b>	2	11.1

**Table (8):**

**Presenting symptoms and signs of intestinal obstruction:**

<b>S&amp;S</b>	<b>No</b>	<b>%</b>
<b>Abdominal pain</b>	10	58.8
<b>Vomiting</b>	16	94.1
<b>Fever</b>	9	52.9
<b>Anorexia</b>	4	23.5
<b>Nausea</b>	4	23.5
<b>Diarrhea</b>	1	5.9
<b>Constipation</b>	10	58.8
<b>Distension</b>	16	94.1
<b>Peristaltic waves</b>	4	23.5
<b>Visible loops</b>	7	41.2
<b>Abdominal mass</b>	1	5.9
<b>Tenderness</b>	10	58.8
<b>Rigidity</b>	4	23.5
<b>Guarding</b>	3	17.6

**Table (9):**

**Presenting symptoms and signs of intussusception**

<b>S&amp;S</b>	<b>No</b>	<b>%</b>
<b>Abdominal pain</b>	14	100.0
<b>Vomiting</b>	14	100.0
<b>Fever</b>	11	78.6
<b>Anorexia</b>	9	64.3
<b>Nausea</b>	0	0.0
<b>Bloody diarrhea</b>	12	85.7
<b>Constipation</b>	1	7.1
<b>Distension</b>	11	78.6
<b>Peristaltic waves</b>	8	57.1
<b>Visible loops</b>	3	21.4
<b>Abdominal mass</b>	5	35.7
<b>Tenderness</b>	3	21.4
<b>Rigidity</b>	0	0.0
<b>Guarding</b>	1	7.1
<b>Intestinal prolapsed</b>	2	14.3
<b>Some dehydration</b>	11	78.6
<b>Sever dehydration</b>	3	21.4

**Table (10):**

**Referral sources of the study population**

<b>Referral center</b>	<b>No</b>	<b>%</b>
<b>Surgeon</b>	2	1.5
<b>Pediatric unit</b>	96	70.6
<b>G.P</b>	17	12.5
<b>Direct</b>	15	11.0
<b>Others</b>	6	4.4
<b>Total</b>	<b>136</b>	<b>100</b>

**Table (11):**

**First line doctor assessing the child first in pediatric emergency units**

**n =96**

<b>Child seen by</b>	<b>No</b>	<b>%</b>
<b>H.O</b>	74	77.1
<b>Registrar</b>	22	22.9
<b>Total</b>	<b>96</b>	<b>100</b>

**Table (12):**

**Time until the pediatric registrar saw the child**

**n =96**

<b>Time</b>	<b>No</b>	<b>%</b>
<b><math>\leq 10</math> min</b>	39	40.6
<b><math>10 \leq 30</math> min</b>	45	46.9
<b><math>30 \leq 60</math> min</b>	7	7.3
<b><math>&gt;60</math> min</b>	5	5.2
<b>Total</b>	<b>96</b>	<b>100</b>

**Table (13):**

**Pediatric consultant information about the refer**

	Yes		No		Total	
	No	%	No	%	No	%
Did he know about the refer	62	64.6%	34	35.4%	96	100%
Did he see the child	38	61.3%	24	38.7%	62	100%

**Table (14):**

**Duration of stay in pediatric emergency units until referral**

**n =96**

<b>Duration</b>	<b>No</b>	<b>%</b>
<b>Immediate</b>	49	51.0
<b>≤24 hr</b>	18	18.8
<b>24≤48 hr</b>	19	19.8
<b>48≤72 hr</b>	7	7.3
<b>&gt;72 hr</b>	3	3.1
<b>Total</b>	<b>96</b>	<b>100</b>

**Table (15):**

**Method of referral**

<b>n =121</b>		
<b>Method</b>	<b>No</b>	<b>%</b>
<b>Doctor and referral sheet</b>	35	28.9
<b>Referral sheet</b>	81	66.9
<b>Verbal</b>	5	4.1
<b>Nurse</b>	0	0.0
<b>Total</b>	<b>121</b>	<b>100</b>

**Table (16):**

**3.1 Management received by children at surgery emergency**

**units:**

<b>Management</b>	<b>No</b>	<b>%</b>
<b>N.P.O</b>	112	82.4
<b>I.V fluids</b>	127	93.4
<b>Antibiotics</b>	128	94.1
<b>Suction&amp;replacement.</b>	66	48.5
<b>Honey bee</b>	18	13.2
<b>Chest tube</b>	2	1.5

**Table (17):**

**Duration of symptoms before presentation  
& outcome**

Duration	Discharge	Died	Total
≤24	70(90.9%)	7(58.3%)	77(100%)
24≤48 hr	22(95.7%)	1(8.3%)	23(100%)
48≤72hr	11(84,6%)	2(15.4%)	13(100%)
>72hr	20(87.0%)	3(13%)	23(100%)
Total	123(91.5%)	13(9.5%)	136(100%)

**X<sup>2</sup>=1.084**

**P value=0.781**

**Table (18):**

**Duration of time until the pediatric registrar saw the  
child & outcome**

Duration	Discharge	Died	Total
≤ 10 min	37(94.9%)	2(5.1%)	39(100%)
10 ≤ 30 min	42(95.5)	3(4.5%)	45(100%)
30 ≤ 60 min	3(42.9)	4(57.1)	7(100%)
>60 min	3(60%)	2(40%)	5(100%)
Total	85(88.5%)	11(11.5%)	96(100%)

**$X^2 = 20.97$**

**P-Value = 0.0001**

**Table (19):**

**Duration of time until the surgery registrar saw the  
child & outcome**

Duration	Discharge	Died	Total
≤ 10 min	13(81.3%)	3(18.8%)	16(100.0%)
10 ≤ 30 min	44(95.7%)	2(4.3%)	46(100.0%)
30 ≤ 60 min	38(92.7%)	3(7.3%)	41(100.0%)
> 60 min	28(84.8%)	5(15.2%)	33(100.0%)
Total	123(90.4%)	13(9.6%)	136(100.0%)

**$X^2 = 4.44$**

**P-Value = 0.217**

**Table (20):**

**Duration of stay in pediatric emergency units until  
referral & outcome**

Duration	Discharge	Died	Total
Immediate	47(95.9%)	2(4.1%)	49(100.0%)
≤24 hr	16(88.9%)	2(11.1%)	18(100.0%)
24≤48 hr	17(89.5%)	2(10.5%)	19(100.0%)
48≤72 hr	4(57.1%)	3(42.9%)	7(100.0%)
>72 hr	1(33.3%)	2(66.7%)	3(100.0%)
Total	85(88.5%)	11(11.5%)	96(100.0%)

**$X^2 = 18.462$**

**P-Value = 0.001**

**Table (21):**

**Mode of transport & outcome**

Transport	Discharge	Died	Total
An ambulance	14(77.8%)	4(22.2%)	18(13.3%)
No an ambulance	111(94%)	9(7%)	118(86.8%)
Total	125(90.5%)	13(9.5%)	136(100%)

**$X^2 = 3.724$**

**P-Value =0.05**

**Table (22):**

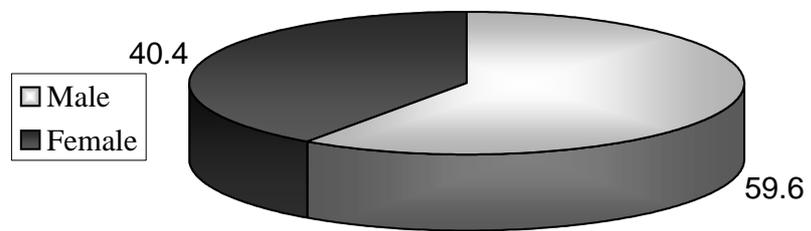
**Diagnosis and outcome:**

<b>Diagnosis</b>	<b>Discharge</b>	<b>Died</b>	<b>Total</b>
<b>Acute appendicitis</b>	19 (100%)	-	19 (100%)
<b>Perforated appendix</b>	18 (100%)	-	18 (100%)
<b>Burn</b>	18 (100%)	-	18 (100%)
<b>Intestinal Obstruction</b>	14(82.4%)	3(17.6%)	17(100%)
<b>Intussusception</b>	12(85.7%)	2(14.3%)	14(100%)
<b>Trauma</b>	13(86.7%)	2(13.3%)	15(100%)
<b>Hydrocephalus &amp; Meningomyelocele</b>	11(91.7%)	1(8.3%)	12(100%)
<b>Strangulated umbilical hernia</b>	6( 100 %)	-	6(100%)
<b>Exomphalos</b>	-	2(100%)	2(100%)
<b>Imperforate anus</b>	7(100 %)	-	7(100%)
<b>T.O.F&amp;O.A</b>	-	2(100 %)	2(100%)
<b>Epididymitis</b>	2(100 %)	-	2(100%)
<b>Congenital diaphragmatic hernia</b>	-	1(100 %)	1(100%)
<b>Total</b>	<b>123</b>	<b>13</b>	<b>136</b>

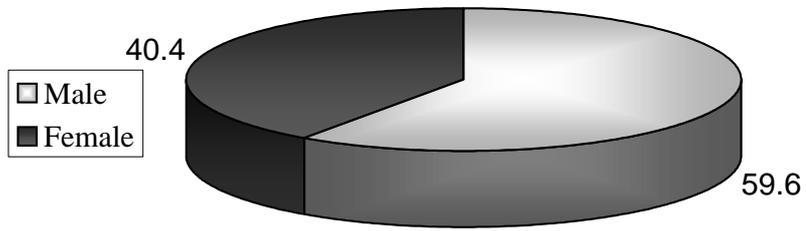
**$X^2 = 43.059$**

**P-Value =0.001**

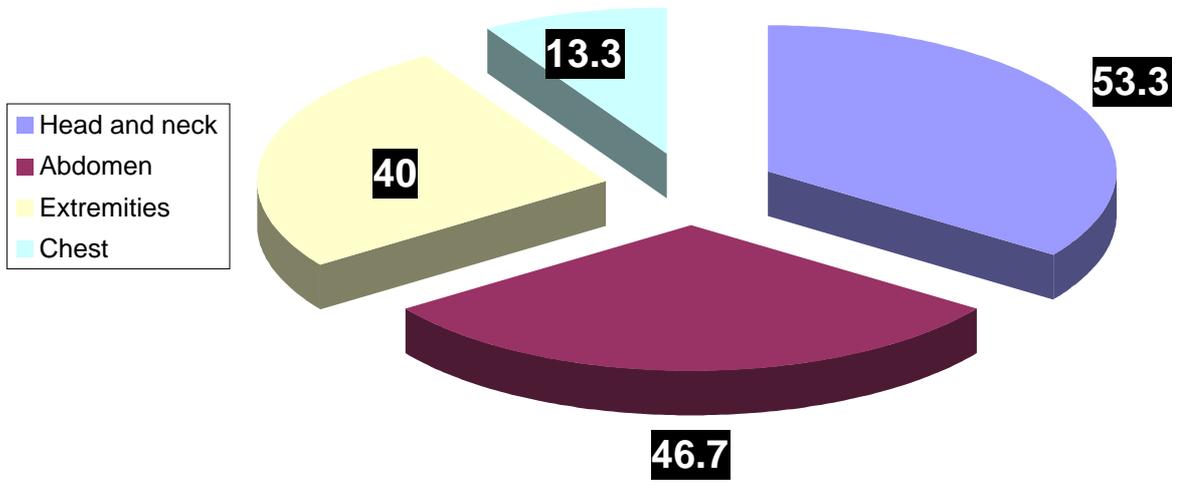
**Fig 1: Distribution of the study population according to gender**



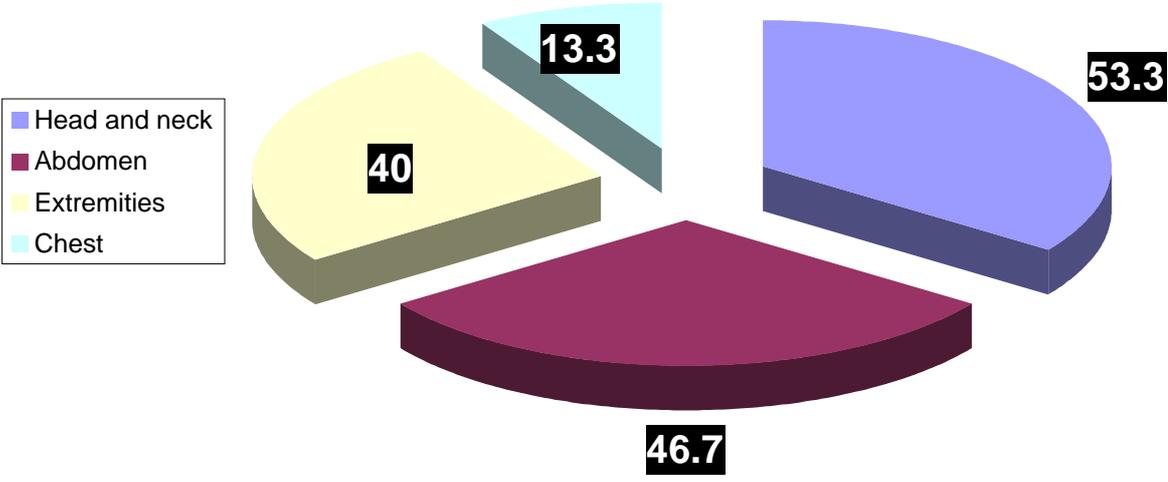
**Fig 1: Distribution of the study population according to gender**



**Fig4: Distribution of the trauma according to effect site**



**Fig4: Distribution of the trauma according to effect site**



**Fig5: Distribution of the burn according to the BSA**

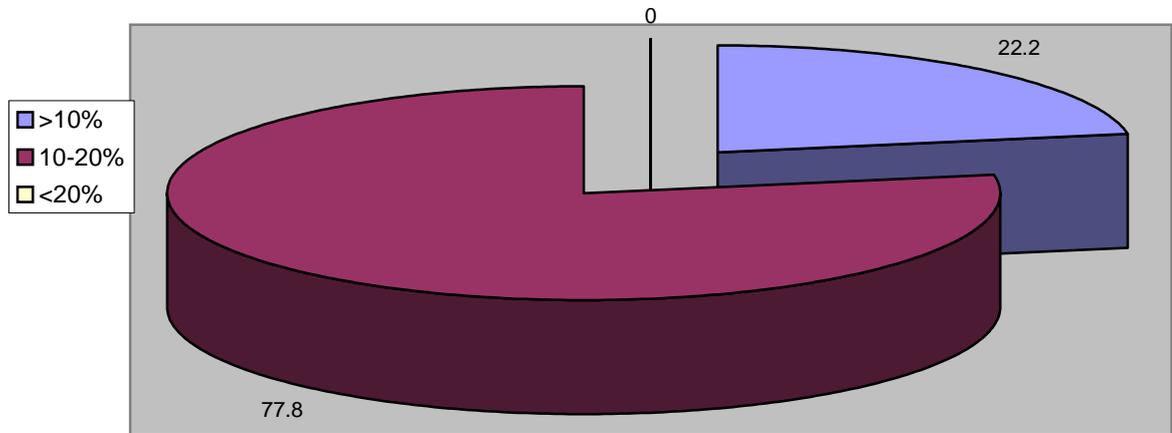
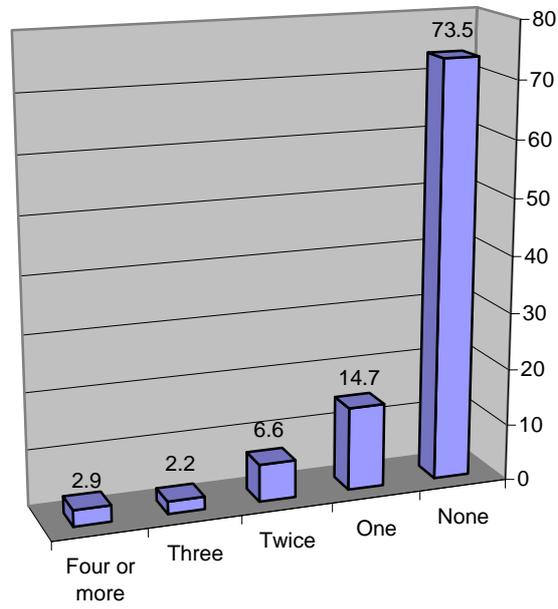
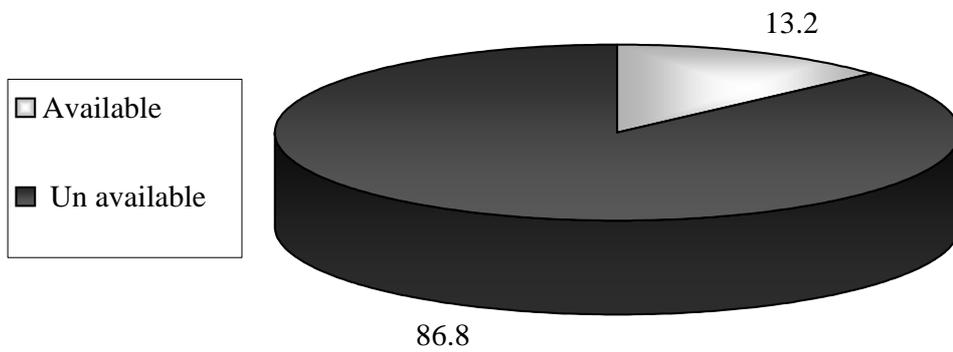


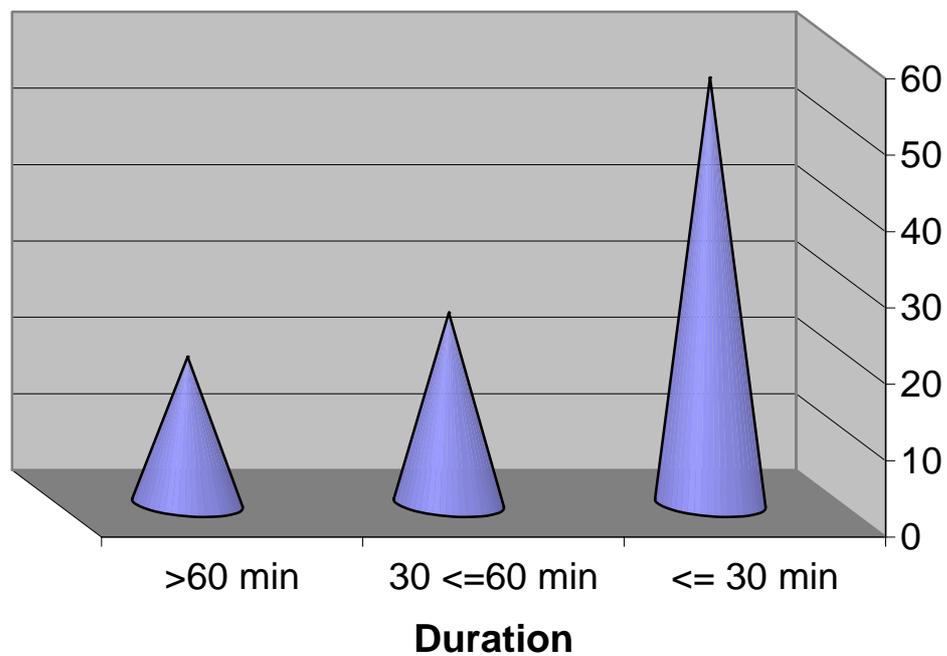
Fig (6) : Number of consultations seen before referring during this illness



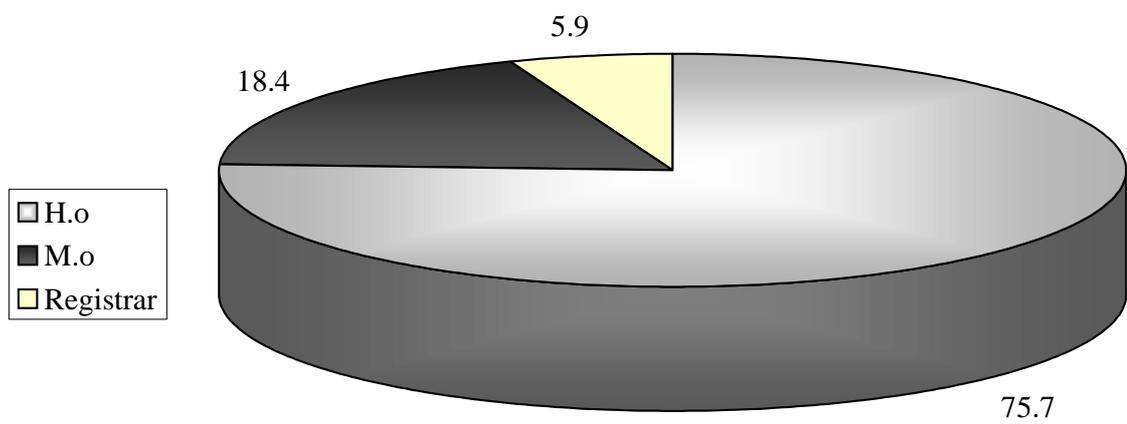
**Fig (7): Resuscitation equipment available during transport**



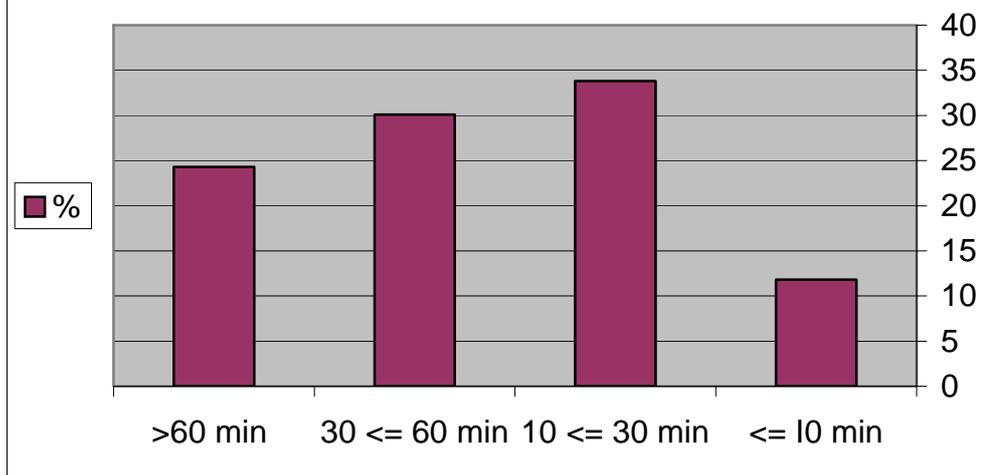
**Fig8: Duration until arrival the surgery casualty**



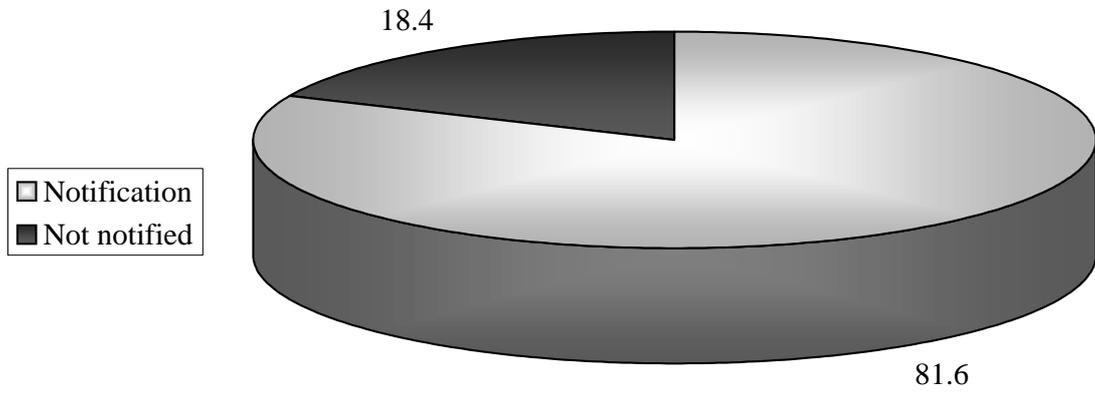
**Fig (9): First line doctor in surgery emergency unit**



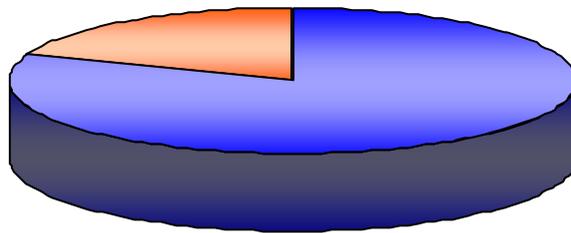
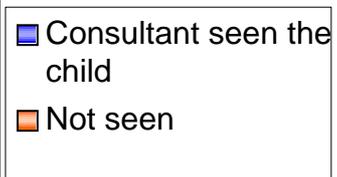
**Fig 10: Duration until registrar or medical officer saw the child at surgery casualty**



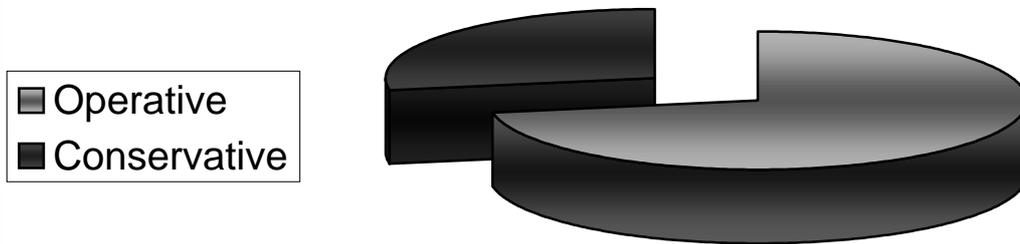
**Fig (11): Surgeon notified**



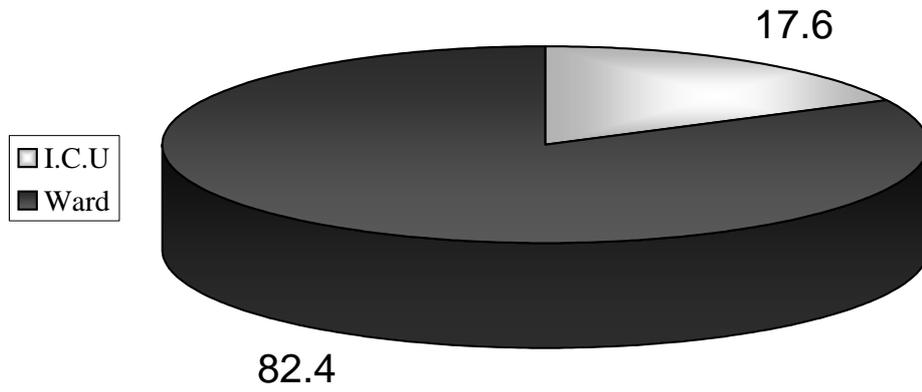
**Fig12: The child seen by the consultant surgeon**



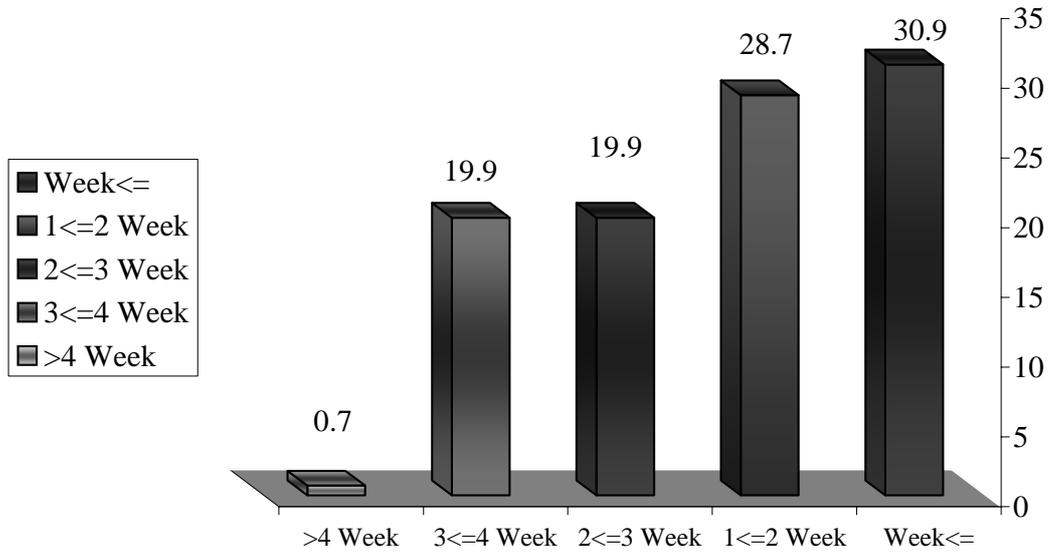
**Fig13: Children need operative treatment**



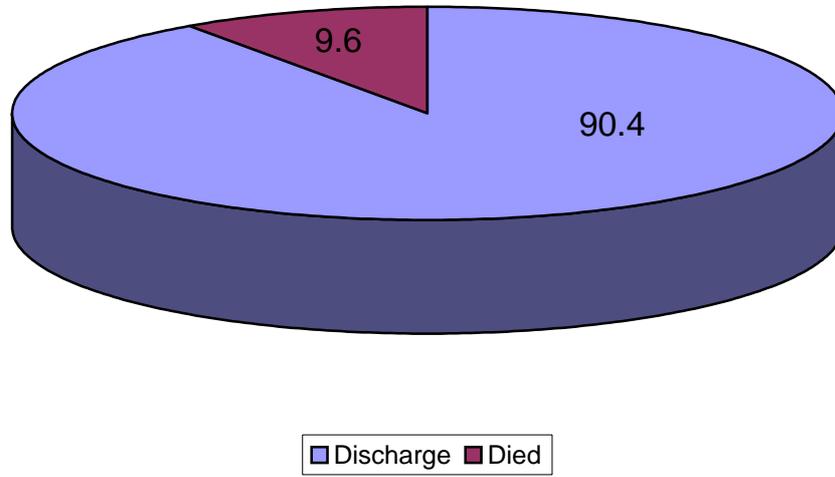
**Fig (14): Place for immediate post-operative care**



**Fig (15) Duration of stay in hospital**



**Fig 16 :Out come**



# Chapter 4

## Chapter 4

### Discussion

In this study it was evident that appendicitis, intestinal obstruction, newborns emergencies and accidental injuries were the common presentation of pediatric surgical emergencies.

Acute appendicitis was the commonest cause of emergency laparotomies (27.2%). In a study done in Portuguese appendicitis was the leading cause with a higher incidence (97%)<sup>(22)</sup>. This attributed to that appendicitis is rare in developing countries, where diets are high in fiber<sup>(6)</sup>. The most frequent symptom of acute appendicitis was abdominal pain (100%), this was similar to the studies done by Nance<sup>(21)</sup> and Concalves<sup>(22)</sup> but the figures there were low (94%, 99%). The most frequent sign of acute appendicitis was abdominal tenderness (94%), similar to the result obtained in U.S.A (95.8%)<sup>(21)</sup>.

The highest incidence of acute appendicitis was between 5-10 years with a peak at 10 years, the same result was reported in Czech-Republic<sup>(25)</sup>. It was more frequent in boys (68.4%) than in girls (31.6%). The same results were found in studies done in Providence<sup>(23)</sup> and Czech-Republic<sup>(25)</sup>. The incidence was 58.3% for boys and 43.7% for girls in Czech- Republic<sup>(25)</sup>.

Perforated appendix accounted for 48.6% of total cases of appendicitis. This result was low compare with 74% in study done in U.S.A<sup>(21)</sup>, and it was high compare with 27.9% in study done in Colorado<sup>(28)</sup>. Perforated appendix had a highest incidence above the 10 years (55.6%). In study done in Czech- Republic<sup>(25)</sup> same result was reported with a low incidence 15.9%.

Perforated appendix was more frequent in boys than girls. This was similar to studies done in Providence<sup>(23)</sup> and Czech- Republic<sup>(25)</sup>. The incidence was different in Czech- Republic<sup>(25)</sup> which was 58.1% for boys and 41.9% for girls. The perforation rate was 2.6% in patients presented with symptoms of 1 day or less. This result was low compare with 7% in study done in U.K<sup>(26)</sup>. In study done in U.S.A<sup>(29)</sup> perforated appendix occurred at almost the same incidence in all sex and age groups.

Appendicitis in the young child was a diagnostic challenge in the study. Six children below 5years presented with acute appendicitis, all of them had perforated appendix (100%). The same result was obtained in U.S.A.<sup>(21)</sup> and in Spain<sup>(27)</sup> but the figure was lower (29%) in Spain<sup>(27)</sup>. Diarrhea was reported in all young children 100%, comparison with 33% in U.S.A<sup>(30)</sup>

Duration of stay at hospital for patients with acute appendicitis was one week or less in (94.7%) and for 1-2 week for (5.3%) of patients. Duration of stay with perforated appendicitis was 1 week in (5.6%), 1-2

week for (72.2%), 2-3 week for (22.2%) of patients. As similar result was obtained in comparison with study done in Colorado<sup>(28)</sup>.

These large numbers of cases with perforated appendix were due to lack awareness among parents and some doctors. The majority of children with perforated appendix had duration of symptoms more than 24 hours. The majority of them were missed diagnosed.

The study did not find a negative laparotomy finding for appendicitis. In Czech- Republic<sup>(25)</sup> they found 15.8%. This attributed to good surgeons experience, although histopathological studies were not done.

The study showed that intussusception was the commonest cause of intestinal obstruction accounted for 14 (45.2%). This was similar to a study done by Azziza<sup>(65)</sup> but the incidence was low (22.2%). Male: female was equal in intussusception. No similar result was obtained in the previous studies done in Norway<sup>(37)</sup> and Sudan<sup>(66)</sup>. In Norway<sup>(37)</sup> boys were 70% and girls were 30%. Also in Sudan, Amir<sup>(66)</sup> found 64% male and 36% female. Infants were the commonest affected age groups (78/6%), same result obtained by Amir (62%) but the figure in the study increased. The presenting symptoms of intussusception were abdominal pain, vomiting, bloody diarrhea, dehydration and abdominal mass in 35.7% similar symptoms presented in the study done by Amir<sup>(66)</sup>. The figures obtained were high except abdominal mass, which was 58%

reported by him (66). Laparotomy was required in 100% of the patients . This figure is high with compared to study done in Norway<sup>(37)</sup>. The Mortality was in 14.3% of patients compared with the same study no mortality was found. Blood in the stools was found in (85.7%). The figure was high when compared with Norway<sup>(37)</sup>.

The study reported 14.3% of patients with intussusception presented with intestinal prolapsed, it was a sign of neglect. All the cases were referred from the pediatric emergency units. Most of them were admitted for more than 24 hours. They had more than two consultations before referring to surgery units. Intussusception associated with increased hospital stay.

The frequent entity in the newborns was hydrocephalus with meningomyelocele 34.3% followed by intestinal atresia 22.8%, imperforate anus 20%, exomphalos 14.3% T.O.F&O.A 5.9 % and congenital diaphragmatic hernia 2.9%. There were no prenatal diagnoses done for these congenital anomalies. In comparison with study done in Spain<sup>(41)</sup>, prenatal diagnosis was made in 7.1 %. The frequent entity in the same study for intestinal atresia was 12.1% and it was low compared with the study, while for esophageal atresia was 5.6% similar to the result obtained in the study. The clinical signs of T.O.F. & O.A were mainly respiratory. The same result obtained in Ireland<sup>(42)</sup>.

In the study newborns with imperforate anus were not screened for tethered cord and associated vertebral anomalies. This screening was done in USA<sup>(44)</sup>. They found substantial number of patients had occult myelodysplasia that may need surgical intervention.

There was no operative mortality for neonates with intestinal atresia, compared to study done in U.S.A<sup>(51)</sup>. They found 4% mortality for duodenal atresia and 0.8 for jejunoileal atresia. In study done by Louhimol<sup>(52)</sup> he found operative mortality for duodenal atresia was 25%. In the study operative mortality for exomphalous and T.O.F & O.A were 100%, in compared to the same study<sup>(52)</sup> which was 35% of exompholus and 15% for O.A and congenital diaphragmatic hernia

The overall survival for T.O.F & O.A was 0 % compared to study done in India<sup>(54)</sup> which was 30–75% for T.O.F & O.A and it was 40 – 100 % for congenital diaphragmatic hernia. This poor outcome due to these patients were admitted in pediatric medicine. They missed diagnosis for more than week and referred after deterioration of the general condition. These patients needed assisted ventilation that was not available in I.C.U. The survival rate intestinal atresia and imperforated anus were 100 %. This result due to early diagnosis and referral.

The study showed the most common causes of accidental injuries were burn, R.T.A, fall down and sharp object respectively. No similar results were found, except in study done in United Arab Emirates<sup>(78)</sup>. They

found burns were the most common cause of injuries in age group less than 5 years.

In Finland<sup>(79)</sup> blunt injuries were the most common cause of accidental injuries. In Nigeria a study showed that falls were the common cause<sup>(80)</sup>. In Ghana<sup>(67)</sup> the most common cause were pedestrian knock. In U.S.A a study showed that falls accounted for 1/3 of all trauma admission. The most common anatomic region affected by trauma was head and neck followed by abdomen, extremities and chest. Head and neck were the most affected side in studies done in Ghana<sup>(67)</sup> and Germany<sup>(77)</sup>. In accidental injuries males were affected more than females similar result were obtained in Ghana<sup>(67)</sup> and United Arab Emirates<sup>(78)</sup>.

Burns affected equally as female different result were obtained in studies done in Iran<sup>(87)</sup>, Portugal<sup>(88)</sup> and Sudan<sup>(95)</sup>. They found males were affected more. In Nepal<sup>(90)</sup> females were affected more than males.

In the study burns occurred in (83.3%) in the age group (1-5yr) and mainly around 3yr. The same result was obtained in studies done in Brazil<sup>(86)</sup> and U.K<sup>(90)</sup> The most common cause of burn was scald (88.9%). The same result was obtained in studies done in Brazil<sup>(86)</sup> and Sudan<sup>(95)</sup> by Omer Ismil. Different result was obtained in Portugal<sup>(88)</sup> which the frequent etiological agent was fire 44% and scald 39% .

All burn patients in study (100%) were treat by honeybee. It was of low cost and decreased infection rate. No patient required surgical

treatment. This is different from the result reported in Portugal<sup>(88)</sup> which 74% required surgical treatment.

In the study RTA was the cause of accidental death, similar result were obtained in United Arab Emirates<sup>(78)</sup> and Finland<sup>(79)</sup>.

There was no death occurred from burns, similar result was reported in a study done in Czech-Republic<sup>(85)</sup>. This is different from a study done in Portugal showed a high mortality rate 68% from burns.<sup>(88)</sup> Burns were associated with increased hospital stay.

The pediatric registrars saw 12.5% of total children after 30 min - more than one hour. Those children seen first by house officers. Most of them were diagnosed as gastroenteritis and were admitted in the gastroenteritis wards. At that time the pediatrics registrars managed ill children in the general wards. The study showed that time before the pediatrics registrars saw the children affected the outcome.

Half the children in pediatric emergency units were referred after 24hour or more. The initial diagnoses were not attributed to surgical causes. The study showed that delay diagnosis in pediatric emergency units affected the outcome. In the study transportation by an ambulance affected the outcome.

The study showed that duration of symptoms before presentation to surgery units, and time before surgery registrar saw the child not affected the outcome.

## Conclusion

- This study showed the pattern of emergency presentation in Khartoum pediatric surgery hospitals.
- The common presentations were appendicitis 37(27.2%), accidental injuries 33(24.2%) and intestinal obstruction 31(22.8%).
- In all children admitted to emergency units males were predominate. Male: female ratio was 1.4:1. Newborns were the most reported age group constituting 35(25.7%) of the study group.
- The majority of children 96(70%) were referred from pediatric emergency units to surgery emergency units.
- First line doctors in pediatric emergency units were house officers 74 (77.1%) and registrars 22 (22.9%).
- Pediatric registrar evaluated 84 (87.5%) during 30 min and 12 (12.5%) in more than 30 min.
- The pediatric consultants were informed about 62 (64.6%) of 96 referred children and saw 38 (61.3%) of them.
- Forty-nine children (51.0%) were referred immediately to the surgical emergency units. The others children 47(49%) were referred after admitted for 24 hours or more.
- Resuscitation equipments were available in 18(13.2%) during transportation.

- The first line doctors in surgery emergency units were house officers 103(75.7%), medical officers in 25(18.4%) and registrars in 8(5.9%).
- Registrar or medical officer evaluated 62(45.6%) during 30 min and 74(54.4%) in more than 30 min.
- The consultant surgeon was notified in 111(81.6%) children.
- Ninety-eight children (72.15%) of the total study population needed operative treatment.
- Authorization by consultant surgeon given in 86(87.8%).
- Immediate post-operative care was in I.C.U for 24 (17.6%) and in the ward for others 112(82.4%).
- Management received by children were N.P.O for 112(82.4%), I.V fluids for 127 (93.4%), antibiotics for 128 (94.1%), suction and replacement for 66 (48.5%), honey bee for burns 18 (13.2%) and chest tube in 2 (1.5%)
- The outcome of study showed 123 (90%) was discharged in good condition and 13 (9.6%) died. The outcome depended on several factors including: Time before the pediatric registrars saw the child, duration of stay in pediatric emergency units and transportation.

## **Recommendations**

1. Improve antenatal care, many emergency surgically treated abnormalities are suspected from antenatal U/S, others abnormalities can be avoided by prophylaxis. Such infants should, if possible, be delivered in the referral center with surgical and intensive care facilities rather than transferred after birth.
2. Establish a multi disciplinary team to handle children present with suspected of emergency surgical problems.
3. Improve our clinical and training programs in order not to miss the cases and decreases the long-term complications.
4. Establish separate pediatric surgery units in Khartoum and other states.
5. Establish preventive priorities and design effective prevention strategies for children, whom are at high risk of sustaining trauma.
6. Improve public education on burns prevention.

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