



Comparative Study Between Plain Abdominal X-Ray and Abdominal Ultrasound in the Diagnosis of Abdominal Pathologies at the Bafoussam Regional Hospital Cameroon

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Abstract: Abdominal pathologies pose serious health problems as many are associated with complications. Plain AXRs and Ultrasound are widely used for diagnosis. The use of plain abdominal x-rays has been greatly criticized. It is against such criticisms that this cross sectional and retrospective study was aimed at comparing the use of the above mentioned imaging modalities in the diagnosis of abdominal pathologies. To achieve this objective, data was collected from the patients who came for the two exams using questionnaires and analyzed using SPSS, version 17.0. Out of the 72 patients, there were more males, 49(68.1%) than females, 23(31.9%), giving a male to female ratio of 2:1. Acute abdomen (35.71%) was the major indication for the exam. The major clinical symptom was abdominal pain (100%) in all the 12 patients involved in the cross sectional study. 33(45.8%) patients had normal results on AXR while 39(54.17%) had abnormal results. Comparing with ultrasound, 20(27.78%) results were normal and 52(72.22%) results were abnormal giving sensitivities of 54.17% and 72.22% for AXR and ultrasound respectively. GIT pathologies in US registered 35(67.37%) cases while abdominal x-ray recorded 29(76.92%) cases. Conclusively, US is more efficient in the diagnosis of abdominal pathologies than AXR. However, the use of AXR in bowel obstruction, perforation, renal stones will improve US diagnosis. Therefore, the two imaging modalities should be used complementarily.

Keywords: Abdominal, X-ray, Ultrasound, Pathologies, Cameroon

1. Background

The human body is divided into two main cavities: The ventral body cavity and the dorsal body cavity. The dorsal body cavity consists of the cranium which houses the brain and the vertebral canal which houses the spinal cord. [1, 2] The ventral body cavity consists of the thoracic cavity and the abdominopelvic cavity. [1] The abdominopelvic cavity is separated from the thoracic cavity by the muscular diaphragm which begins from the tip of the xyphoid process

and terminates at the symphysis of pubis (the fibrous joint linking the two coxal bones anteriorly). [2, 3] The abdominopelvic cavity as the name implies consists of the abdominal cavity and the pelvic cavity even though there exists no physical separation between the two cavities. Organs imbedded in this cavity are called the viscera. [2] The walls are composed of skin, connective tissue, muscles and serous membranes. [1] Organs contained in the abdominal cavity are the spleen, stomach, liver, gall bladder, pancreas, and small intestine, most of the large intestine, blood vessels,

the kidneys and the ureters. [2, 3] The lower portion which is the pelvic cavity consists of the urinary bladder, sigmoid colon, rectum, the male and female reproductive organs for males and females respectively. [1-3] By drawing an imaginary line from the pubic symphysis to the sacral promontory, the abdominal cavity can be separated from the pelvic cavity. [2, 3] The sacral promontory is the superior border of the sacrum. [3]

To further locate the position of abdominal pain, abdominal mass, tumors or other abnormalities, the abdominopelvic cavity is further simplified into four quadrants which are the right and left upper quadrants and the right and left lower quadrants obtained by drawing a horizontal line across the umbilicus and a perpendicular vertical line in the midline of the body. [3, 4] The above divisions are important in plain abdominal X-Ray (AXR) especially in situations of calcifications or occlusions and also during ultrasound scans of the abdominopelvic cavity. [2, 4] All the above organs in the cavity are each affected by varied pathological conditions which usually present as an acute abdomen in most cases and require proper and rapid specific diagnosis for prompt medical interventions. [1, 4, 5] Most of these abdominal pathologies usually cause severe abdominal pains (known as an acute abdomen). [5] Abdominal pathologies which cause an acute abdomen are: viral gastroenteritis, intestinal obstruction, acute appendicitis, acute pancreatitis, diverticulitis, cholecystitis, cholangitis, gastritis, chron's disease, diabetic ketoacidosis, abdominal tuberculosis, pyelonephritis, aortic aneurysm, ruptured spleen, haemoperitoneum, heart burn, heart attack, chest pathologies such as pneumonia of the lower lung lobe, kidney stones and other nephropathies of the urinary system. [2, 4, 5]

In women, common pathologies encountered are pelvic inflammatory diseases, ovarian cysts, uterine polyps, uterine fibroids, ectopic pregnancy, endometriosis and menstrual cramps. [6, 7] Particular to children are intussusceptions (the telescoping of one portion of the intestine into another, causing obstruction of the bowel and blockage of flow, volvulus (twisting of the colon around itself), hischsprung's disease (congenital mega colon), hypertrophic pyloric stenosis and other congenital defects of the digestive tracts. [3, 5, 7] Most patients presenting in the emergency department of the hospital usually exhibit some clinical symptoms and signs such as persistent severe pains, swelling and or tenderness in the lower, upper and or middle abdomen, guarding (involuntary contraction of the abdominal muscles); rigidity (abdominal muscles are tensed and board-like), fever, bowel sounds and rebound tenderness in the abdomen. [4, 7] Plain AXR has traditionally been used as the first diagnostic tool for most abdominal pathologies which present as acute abdomen. Plain AXR coupled with a posteroanterior (PA) CXR can show some abdominal pathologies such as pneumoperitoneum, stones, obstruction, aneurysms, volvulus and masses but the draw back with its use is the lack of specificity in most cases, low accuracy, high radiation dose and patient discomfort in the course of doing the various

projections. [4]

The use of plain AXR is gradually being replaced today with more sophisticated, high specific and more accurate imaging modalities such as ultrasound to do a rapid diagnosis of abdominal pathologies. [7, 8] Various projections of the abdomen are done based on the indication for the exam notably anteroposterior (AP)- erect, AP-supine, left lateral decubitus, dorsal decubitus, lateral decubitus, prone abdomen, oblique projection, renal supine abdomen, AP-renal supine abdomen. [1, 3, 4] The cassette size used mostly is 36x43cm but could be varied depending on patient size and also projection. [3, 9, 10] Typical exposure factors are within the range of 60→80kVp and 32→80mAs depending on the size of the patient, the age of the x-ray machine and the technique employed. [1, 5, 7, 9, 10]

Plain abdominal x-rays are also used prior to performing some special radiographic exams, such as intravenous urography (IVU), barium meal and barium enema. [3-5] However, plain x-ray use has been criticized today in the emergency department for diagnosis of abdominal pathologies and ultrasound scans have been fast replacing plain x-ray use. [4, 6, 7] An ultrasound scan of the abdomen can diagnose a wide variety of abdominopelvic pathologies with much accuracy, high sensitivity and very high specificity when compared to plain abdominal x-ray. [2-4] Besides this, ultrasound does not expose the patient to any ionizing radiation; it is also cheap, easily accessible, requires minimal positioning of the patient (much comfort) and unlike x-rays of the abdomen could tell the cause of most acute abdomen conditions. [4] Notwithstanding, ultrasound scans are operator dependent, thus the result of the scan depends on who is doing it and no one else can interpret the scan. Against this lone drawback, the scans are obtained in real time thus giving more dynamic information about abdominal structures and also permit Doppler scans for much detailed information. [1-3] To perform the scan, minimal patient preparations are required and transducers of various frequencies are used (2.5 MHz, 3.5 MHz, and 7 MHz) to scan different organs based on the need of the exam. [7-9] The patient usually is positioned supine and could be tilted in oblique positions and or placed in the lateral decubitus positions to obtain good scans where necessary. [3, 4] Graded compression techniques are also applicable where necessary. [1, 3-5]

This study is thus aimed at comparing the use of plain abdominal x-rays and abdominal ultrasound scans in diagnosing abdominal pathologies. It is also worth noting that x-rays of the abdomen are still effective in the diagnosis of some abdominal pathologies, thus this study was aimed at bringing out those pathologies compared to ultrasound scans such that the modalities can be used complementarily for proper diagnosis and hence proper treatment of the pathological condition.

Abdominal pathologies still remain a health problem at all levels of the society. Studies show that most patients presenting at emergency departments (EDs) of most hospitals show up with abdominal pains (a common symptom of most

abdominal pathologies). [1-4] Pain is distressful and causes loss of concentration at work and any other business. [3, 7, 10] An abdominal pathology not properly checked can cause peritonitis (inflammation of the mucosal lining of the peritoneum due to bacterial action and irritation from leaked contents of the gastrointestinal tract GIT). [2-4] Peritonitis causes a lot of discomfort. Fistulas could easily develop as well. [2, 4, 8] Abdominal pathologies in neonates and infants is a course for concern especially considering the fact that they may not know how to express their feelings, thereby being at risk of complications especially if the right diagnosis is not obtained. [2, 4-7]

Further adding to the difficulty is the fact that the etiologies of abdominal pains in children range from trivial (constipation) to potentially life threatening situations such as malrotation with mid gut volvulus, also most of them present with little difference; causing a very high rate of missed diagnosis. [1-3] In the elderly abdominal pathologies pose a lot of problems due to the fact that they may lack the necessary febrile response and are most at risk of leukocytosis which in complicated cases could lead to leukemia and severity of pains. [7-9] Managing abdominal pathologies in the immunosuppressed is also a very challenging task due to their reduced immune function which may delay in mounting a response to infections. [1, 4] This causes delayed onset of fever and other typical symptoms in which case this delayance could complicate most pathological conditions. [3, 4] In the past, the diagnosis of most abdominal pathologies especially those presenting as an acute abdomen limited to clinical exams, patient history and few lab tests. [2, 3]

However, the advent of medical imaging has resolved most of the false positive findings associated with such management interventions. The services are limited in the country as of now. [4, 7, 8] The emergence of computerized tomography (CT), magnetic resonance imaging (MRI), ultrasound (US), conventional radiography, and others have a lot to do in diagnosis of abdominal pathologies. [1, 3, 6] The use of plain x rays have been criticized due to its drawbacks in the management of most abdominal pathologies and nowadays, US scans are gradually gaining much grounds. [1, 2] It is against such criticisms on plain AXR use in diagnosis of abdominal pathologies that our study was aimed at comparing its diagnostic value to that of ultrasound scans of the abdomen in order to determine which is best for the diagnosis especially looking at their relative availability in most hospitals today for the diagnosis of abdominal pathologies which if left unchecked could cause fatal consequences. [1, 3]

This study is significant in that:

Information gotten regarding the efficiency of plain abdominal x-rays and abdominal ultrasound in diagnosing abdominal pathologies shall guide practitioners in the field.

Students and radiological technologists shall be informed on the main radiographic views which will help in the proper diagnosis of abdominal pathologies.

The relative draw backs of ultrasound as well as plain

abdominal x-rays shall be appreciated, thus providing much more evidence which will guide in informed decision making as regards the use of plain abdominal x-rays as well as ultrasound, thereby enabling the government to create more medical imaging centers with CT scanners, MRI scanners and subsidize most exams for the well fare of the general public.

The relative advantages of ultrasound scans to plain abdominal x-rays shall also be realized at the end of this study. These shall be used as evidence based research data for policy making decisions with regards to health issues.

Other research related areas associated with abdominal pathologies shall be realized, thereby providing future research topics for students in the field.

Hypothesis of the study was; Gastrointestestinal tract pathologies are the major indications for plain abdominal x-ray and abdominal ultrasound.

The objective of this study was to compare the use of abdominal ultrasound and plain abdominal x-rays in the diagnosis of abdominal pathologies.

Plain abdominal x-rays are widely used in the diagnosis of abdominal pathologies and during special radiographic exam procedures. Ultrasound of the abdomen can diagnose a wide variety of diseases and has more advantages than AXR. Our focus was on the use of these imaging modalities in the diagnosis of abdominal pathologies.

The study was limited in the following ways. Some recorded information from which retrospective data was collected was not clearly written, thereby limiting the sample size. Some patients were not very collaborative, thereby limiting our access to information.

2. Materials and Methods

2.1. Study Design

This was a cross sectional and retrospective study which took place from the 19th January, 2015 to the 13th February 2015.

2.2. Study Area

The study was carried out at the Bafoussam Regional Hospital, located in the West Region of Cameroon. This study area was chosen for the following reasons:

- The x-ray service of the hospital is equipped with digital x-ray services.
- We actually anticipated that the study population could be met in this area.
- Students on internship are usually given liberty to perform the standard x-ray exams under the supervision of the technicians and also assist in special radiographic exams thereby helping us improve on our skills.
- The staff of the department is very cooperative and understanding.
- Students are also allowed to observe ultrasound scans in the service by the kind radiologists.

2.3. Study Population

This study involved all patients who presented at the Radiology service of the Bafoussam Regional Hospital for plain abdominal radiography and for abdominal ultrasonography.

2.3.1. Inclusion Criteria

All patients that were referred for abdominal ultrasonography and plain abdominal x-rays were included.

2.3.2. Exclusion Criteria

- All the pregnant patients.
- Those with gynecological problems.
- On the basis of retrospective review, patients with vague information were excluded.

2.4. Sample Size and Sampling

72 patients were involved in this study and the sample size was calculated thus:

$$\text{Using the formula; } E_{\max} = \frac{Z\alpha}{2} \left(\frac{S}{\sqrt{n}} \right)$$

Where E_{\max} = max error and is the study duration.

$$\frac{S}{\sqrt{n}} = \text{level of confidence}$$

S = standard deviation

n = sample size

$$\Leftrightarrow \frac{E_{\max}}{\frac{Z\alpha}{2}} = \frac{S}{\sqrt{n}}$$

$$\Leftrightarrow \sqrt{n} = \frac{S \cdot Z\alpha}{E_{\max}}, \text{ and squaring both sides,}$$

$$\Leftrightarrow n = \left(\frac{S \cdot Z\alpha}{E_{\max}} \right)^2$$

Using S= 17.32, got from the literature review and $\frac{Z\alpha}{2} = 1.96$, got from the standard table, working at 95% confidence and $E_{\max} = 4$ weeks (duration of study).

$$\Leftrightarrow n = \left(\frac{S \cdot Z\alpha}{E_{\max}} \right)^2$$

$$\Leftrightarrow n = \frac{(1.96)(17.32)^2}{4}$$

$$\Leftrightarrow n = 72.2$$

Therefore n=72 patients to 1 decimal place.

2.5. Study Procedure

2.5.1. Administrative Clearance Procedure

Clearance was obtained from the Medical Diagnostic Imaging and Radiotherapy Department of the school upon presentation of the research proposal. An authorization was also obtained from the Director of Bafoussam Regional Hospital upon presentation of the research proposal.

2.5.2. Approach to Participants and Data Collection

Patient's consent was sought before getting any information; Patients were reassured of confidentiality in dealing with their information; Data was generated through observation and interview; Data collected was kept confidential.

2.6. Data Management and Analysis

2.6.1. Data Management

Collected data was entered into the data collection sheet, backed up on exercise books, Compact Discs (CDs), USB keys and regularly checked to avoid information loss.

2.6.2. Data Analysis

Data was collected using questionnaires and entered into Microsoft Excel for summarization. The summarized data was analyzed using SPSS (Statistical Package for Social Sciences) version 17.0 and the results presented using tables, pie charts, and Bar graphs. The relationship between Abdominal Ultrasound and Abdominal x-rays taking into consideration GIT pathologies was assessed using Spearman's Correlation. Statistical significance from the correlated results was designated as $P=0.1595$ (i.e. $P>0.05$).

2.7. Ethical Considerations

In line with the ethical principle of Justification, a research clearance was obtained from the school and the Directorate of the hospital prior to data collection. Patient information was kept confidential and the patients were assured of this in line with the principle of Fidelity. Patient's consent as whether to provide information or not was respected in line with the Principle of Autonomy.

3. Results

3.1. Demographic Data

Table 1. Demography of the Study Population at Enrolment.

Characteristics	No. of Participants.	Percentage (%)
Gender:		
Male	49	68.1
Female	23	31.9
Age group(years):		
0 – 16	10	13.9
17 – 33	28	38.9
34 – 50	11	15.3
51 – 67	11	15.3
68 – 84	11	15.3
85 – 101	1	1.3
Total	72	100%

Table 1, shows that 49 (68.1%) patients were males and 23 (31.9%) were females; giving a male: female ratio of approximately 2:1. The most prevalent age group was 17-33 (38.9%) and the least prevalent age group was 85-101 (1.3%). The mean age was 38.89 years.

3.2. Clinical Indications of the Examination

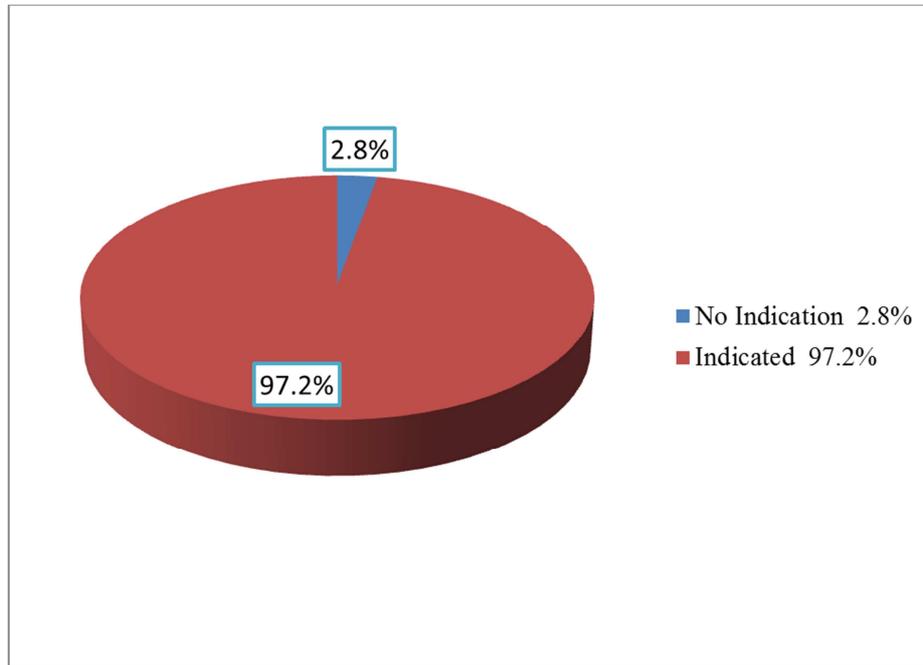


Figure 1. Clinical Indications for the Examination.

The above figure shows that 70(97.2%) patients had indications for the exams and 2(2.8%) patients had no indications.

3.3. Ultrasound Diagnosis

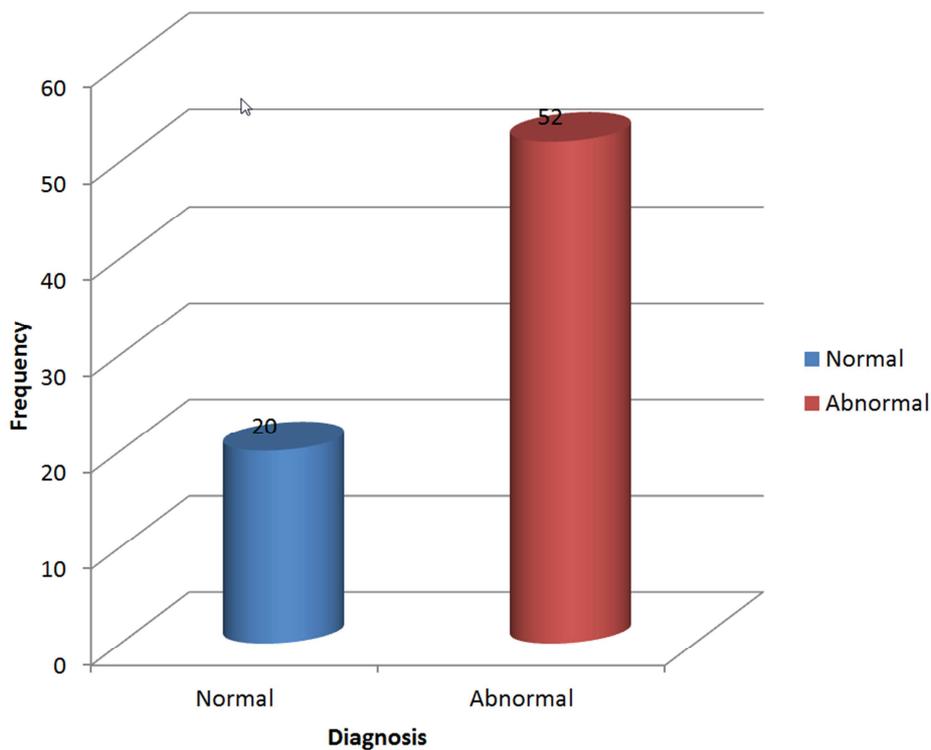


Figure 2. Bar Graph Showing the Ultrasound Diagnosis.

Figure 2 shows that 20(27.78%) results were normal and 52(72.22%) results were abnormal.

3.4. Abdominal X-Ray Diagnosis

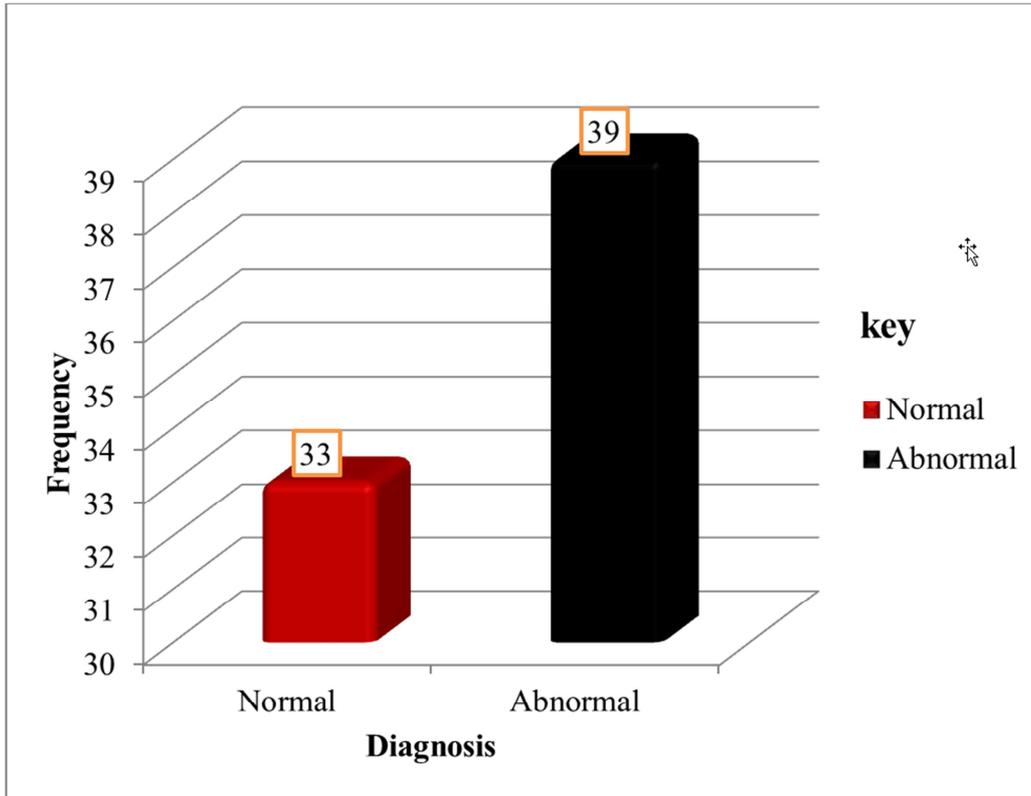


Figure 3. Bar Graph Showing Diagnosis by Abdominal X Rays.

The figure above shows that 33(45.83%) patients had normal results and 39(54.17%) patients had abnormal results.

3.5. Clinical Features Presented for Abdominal Ultrasound and Abdominal X-Ray

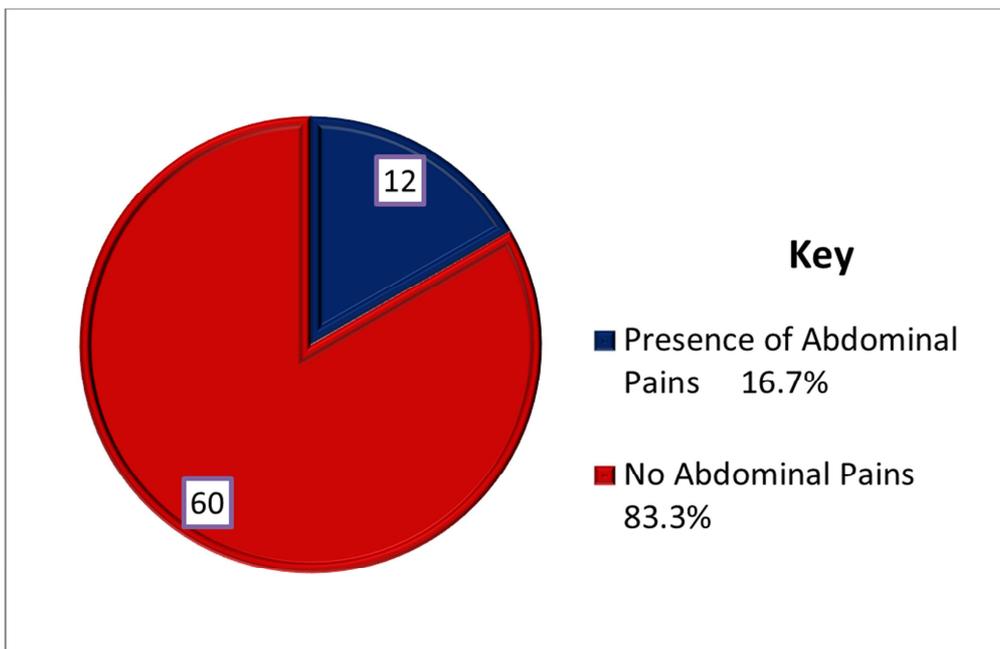


Figure 4. Pie chart showing clinical features for the exam.

Figure 4, shows that 12(16.7%) patients had abdominal pains while 60(83.3%) patients had no abdominal pains.

4. Discussion

Table 1, shows that 49 (68.1%) patients of the study population were males and 23(31.9%) were females; giving a male to female ratio of approximately 2:1. The most prevalent age group was 17-33(38.9%) with a total of 28 patients, while the least prevalent age group was 87-101(1.3%) with 1 patient. The average age of the study population was 38.89 years and the ages ranged from 3 weeks 2 days to 90 years.

These results were similar to those of Sharma. [4] They recorded a male to female ratio of 1.5:1 in their findings. The results were also in line with those of Aviral. [8] Their study recorded 49 males (65.33%) and 26 females (44.67%). Majority of those who presented for the exam were students; 16 in number (22.22%), followed by workers; 15 in number (20.83%) and then 14 housewives (19.44%). This could be due to factors such as:

- The occupation of the patient
- Patient age and gender which predisposes the patient to different abdominal pathologies

From figure 1, out of the 72 patients, 70(97.2%) patients had indications for plain abdominal x-ray and abdominal ultrasound and 2(2.8%) patients had no recorded indications for the exams. Of the 70 indicated exams, the highest encountered indication was acute abdomen with 25(35.7%) patients and the least prevalent indications were pneumoperitoneum, gastric ulcers, abdominal sores, ascites, ingested foreign body, congenital mega colon, post operative peritonitis with occlusion; each with 1 patient, giving 1.42% each. Intestinal occlusion was secondary to acute abdomen with 14(20.00%) patients. Abdominopelvic peritonitis had 5(7.14%) patients, trauma in 5(7.14%) cases, and intestinal perforation in 8(11.4%) cases. The results show that acute abdomen was the major indication (35.71%), followed by obstruction (20.00%), perforation (11.48%). These results were similar to those of Sharma, who reported that abdominal pain (acute abdomen) was a major indication (53%) for Plain AXR and abdominal US. Other indications were acute pyelonephritis with 2(2.86%) patients, acute appendicitis with 2(2.86%) patients.

Jain reported that out of the 52 patients who had GIT pathologies as clinical indications in their study, 31 (59.6%) had features of GIT obstruction, 13(25%) patients had acute appendicitis and 8(15.38%) patients had perforation as an indication. [1]

This could be due to; The progressive development of infections and inflammations which are associated with pains; Bowel obstruction has diverse causes like volvulus, congenital malformations, post surgical adhesions just to name these; Patient social history such as poor nutritional habits, alcoholism and family history such as diabetes, obesity.

The 2 recorded cases that had no results could be due to omission error from the ED department or the x-ray reception as most acute abdominal cases were emergencies.

The results of Jain *et al*, were however contrary to our findings with respect to GIT obstruction (20.00%) and acute appendicitis (2.86%). [1]

They had 31(59.6%) cases of GIT obstruction and 13(28.00%) cases of acute appendicitis

- The difference might be due to the difference in the duration of study,
- These differences could also be due to the fact that their indications were based on diagnosis from other clinical tests such as laboratory findings and laparoscopy.
- Their study also targeted only patients who were less than 15 years in age.

From Figure 2, 20(27.78%) results were normal, and 52(72.22%) results were abnormal on abdominal ultrasound. Out of the 52 abnormal results recorded, GIT pathologies recorded the highest percentage with 35(67.31%) cases. Renal disorders were encountered in 5(9.62%) patients, pelvic pathologies in 5(9.62%) cases as well, ruptured spleen with haemoperitoneum, traumatized pancreas with haemoperitoneum and necrosis of the right testicle with fluid collection each recorded in 1(1.92%) case. 4 patients (7.69%) had no recorded results.

Furthermore, out of the 35 recorded GIT pathologies, US diagnosed 5 cases of occlusion (14.29%) and 4 cases of peritonitis due to bowel perforation (11.43%).

This gave a sensitivity of 72.22% for ultrasound. US also had 100% specificity and sensitivity in the diagnosis of pelvic pathologies, splenic rupture and traumatized pancreas with haemoperitoneum.

These results were similar to those of Sharma *et al*, wherein they recorded 4 cases (7.4%) of intestinal obstruction and 3 cases (5.5%) of peritonitis due to bowel perforation. In our study, 2 cases of pelvic abscesses (2.85%) were recorded in line with the results obtained by Sharma *et al*, 2010 who had same number. This could be because of; Age associated predisposing factors; improved sensitivity of ultrasound to soft tissue pathologies; Ultrasound scans give cross sectional images and permits Doppler studies thereby improving on the detection of soft tissue pathologies.

Jain *et al*, conducted a prospective study of 200 patients in which 52 patients (28%) had urinary problems and their results were however contrary to ours in that out of the 52 abnormal results, 5 cases had urinary problems (9.62%). [1, 2]

The differences might be due the fact that CT scan was one of the modalities used to report the final diagnosis; They also had longer study duration and a larger sample size; Advanced technology and the study setting could also account for the difference.

In this study, US detected 6 (11.54%) cases of ascites due to perforation, 1 case of PID (1.93%) and 1 case of endometriosis (1.93%). These results were similar to those of Jain *et al*, who reported that US is very sensitive in detection of gynecological problems. [1] These similarities could be

due to the fact that; The ultrasound scans in their study were performed by Radiologists just like ours; Ultrasound produces cross sectional images thereby improving on the detection of soft tissue pathologies.

On the other hand, figure 2 shows that 33(45.83%) patients had normal results and 39(54.17%) results were abnormal on plain abdominal x-rays. All patients were subjected to erect Plain AXR and PA chest x-ray. Plain AXR diagnosed 8 different pathologies out of which occlusions were the highest in number with 17(43.59%) cases. The least prevalent pathologies were opacification, hilar adenopathies, and bladder stones with 1(2.56%) case each. Other pathologies diagnosed on Plain AXR included perforation in 5(12.82%) cases, constipation in 5(12.82%) cases, Pneumoperitoneum in 2(5.13%) cases and 2(5.13%) cases of lumbar discarthrosis. 5 (12.82%) patients were recorded with no results. From the above recorded results, GIT pathologies took the highest percentage with 29 cases (76.92%); while urinary tract pathologies carried the least with 1 patient (2.56%). These results were similar to those of Sharma *et al*, who found out that Plain AXR diagnosed bowel perforation in 5 cases (9.2%). They also found out that GIT pathologies were the most encountered with 19 cases (35.18%). [4] The reasons for this could be that; The abdomen is rich in different organs which could be exposed to varied pathological conditions which may be as a result of toxic, metabolic and cardiovascular causes; Plain abdominal x-rays are sensitive to bowel perforation and bowel obstruction.

However, there were other conflicting factors with our study. They recorded 6 normal radiographs in their study and they diagnosed hepato-biliary pathologies in 12 cases. They recorded urolithiasis in 8 cases. These conflicts could be because; Traditional 3 views for Plain AXR were obtained in their study; Their final diagnosis was established based on other clinical and laboratory findings; This increase could also be due to advanced technology in their own area of study; The difference might also be due to our different study duration, the type of study and the sample size employed.

Figure 4 shows the clinical features with the patients presented for the exams. Out of 72 patients, 12(16.7%) patients had abdominal pains while the 60(83.3%) patients who were reviewed retrospectively had no recorded information on clinical signs and symptoms. The 12(100%) patients reviewed cross sectionally all had abdominal pain as the major clinical symptom. 9(75%) cases had gradual pains, while 3 (25%) had sudden pains.

Aviral *et al*, had similar results in their study in which they reported that abdominal pain was the major symptom with which patients presented (88.16%).⁸ Choi *et al*, also had similar results in their study in which they also found out that abdominal pain was the main complaint with which patients presented (85.9%). [7]

Other signs and symptoms with which patients presented included vomiting in 6(50%) cases, constipation in 4(33.33%) cases, swollen and tender abdomen in 3(25%) cases while sweating, painful urination and difficulty stooling recorded

the least percentage with 1(8.33%) case each. These results were similar to those of Aviral *et al*, who reported vomiting in 50.67% cases, abdominal tenderness in 90.67% cases, distention in 72% and rigidity/ guarding in 56% of their study population.[7, 8] This may be because; Abdominal pathologies such as bowel obstruction cause vomiting, constipation; Vomiting centers in the brain are stimulated by pain; Pathologies such as peritonitis cause involuntary guarding of the abdominal muscles.

As regards pain location, 4(33.3%) patients had periumbilical pains, 2(16.67%) patients had left upper quadrant pain, 1(8.33%) case of epigastric pain, 2 cases (16.67%) of left lower quadrant pains, and 3(25%) cases of diffused abdominal pains. Hardy *et al*, conducted a similar study and reported that the physical examination of patients can suspect particular pathologies. [2]

5. Conclusion

Acute abdomen was the major indication for plain abdominal x-ray and abdominal ultrasound. Ultrasound scans mainly diagnosed bowel obstruction and peritonitis while plain AXR diagnosed mainly bowel obstruction, perforation and constipation. From the results, ultrasound is the best imaging modality for abdominal pathologies. Abdominal pain was the major clinical feature. Major limitation of ultrasound is that it is operator dependent while plain AXRs were less sensitive and specific to soft tissue pathologies. However, the efficient use of both modalities provides a better diagnosis.

GIT pathologies are not the major indications for abdominal x-rays and abdominal ultrasound which implies that the stated hypothesis is rejected.

Recommendations

We recommend the following: Strict handling of patient information and preservation will improve retrospective research at CRIMO department of the Bafoussam regional hospital.

Access to stored ultrasound images should be granted the x-ray staff of CRIMO to facilitate collection of images for research studies by students.

Additional radiographic views in the plain AXR series at CRIMO should be implemented for sufficient information as regard the illness of the patient. These are AP supine and Left Lateral Decubitus views.

The clinical features patients present with be documented and the indications clearly defined by the ED staff of Bafoussam Regional Hospital to facilitate data collection and proper diagnosis.

Other studies should be conducted to assess the relationship between the clinical signs with which patients present and the associated pathologies diagnosed.

Research works on predisposing factors of acute abdomen could be conducted.

Competing Interests

The authors declare no conflict of interest in designing, conducting and reporting the findings of this work.

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Annexes

Data Collection Tool

A) Patient demographic information

- (1) Age _____
- (2) sex _____
- (3) Occupation _____

B) Clinical signs and symptoms

- Bowel sounds
- Constipation
- Diarrhea
- Vomiting
- Others(please specify) _____

C) Exam requested:

1. Abdominal X-ray
2. Abdominal Ultrasonography

D) Indication of the exam _____

E) History of abdominal problems?

- Surgery
- Carcinoma
- Ingestion of foreign body
- Trauma
- Congenital mega colon

F) Diagnosis:

1. Plain abdominal x rays. _____
2. Abdominal ultrasound _____

G) Life style of the patient:

1. Smoke cigarette? (Yes) (No)
2. Drink alcohol? (Yes) (No)
3. History of diabetes (yes) (no)
4. Patient obese (yes) (no)
5. History of pulmonary disease _____

H) Onset of abdominal pains:

1. Sudden _____
2. Gradual _____

K) Duration of abdominal pains _____

L) Location of abdominal pains _____

1. Right Upper Quadrant
2. Left Upper Quadrant

3. Right lower quadrant

4. Left lower quadrant

5. Epigatric region

6. Periumbilical region

7. Diffuse pains.

M) Exposure to environmental toxins:

1. Lead yes () no ().
2. Iron poisoning yes () no ().
- Others _____

Definition of Concepts

• Comparative study:

This is a study in which the similarities and differences of one or more things are evaluated relative to some other thing or each other.

• Abdominal x-ray:

It is the radiographic exploration of the abdomen which diagnosis a wide variety of pathologies using x-rays and involves a series of views with a PA CXR.

It is also used as a preparation film prior to some special radiographic exams such as cholangiography, IVU, Barium exams.

• Ultrasound scans:

These are cross sectional images of the body produced with the use of sound of very high frequency, (greater than 20KHz) to diagnose a wide variety of pathologies. Doppler studies are done to evaluate blood supply and also in obstetrics.

• Diagnosis:

It is the identification of the nature and cause of an illness.

• Pathology:

The branch of medicine concerned with the study of the nature of diseases and their causes, processes, development and consequences.

It is also defined as a deviation from a healthy or normal structure or function, an abnormality, an illness or a malformation.

• Retrospective study:

Also called a historic cohort study, generally means to take a look back at events that have already taken place. It is a medical study in which the medical records of groups of individuals who are alike in many ways but differ by certain characteristics are compared for particular outcome.

• Cross sectional study:

This is an observational study in which data collected from a population or the representative subset of the population at a specified point in time is analyzed. This type of study permits the generation of information concerning the causes of pathology and its prevalence.

• Obstruction:

This is a mechanical or non mechanical blockage resulting from a structural abnormality that presents a physical barrier to the progression of gut contents.

• Pneumoperitoneum:

It is the presence of air or gas in the peritoneal cavity.

- Sensitivity (electronics):

It is the degree of response of an instrument to a change in the input signal.

- Specificity (medicine):

This is the extent to which a particular diagnostic test is specific for a given condition.

- Accuracy:

It is the state of being free from mistakes, the exact conformity to truth, or to a rule or model, degree or conformity to a true or standard value.

- Emergency department:

It is the hospital department that treats emergency situations, that is, those life-threatening situations of health that require prompt medical intervention. For example: bowel perforation.

References

- [1] Jain P. K., Liyakat A., Mishra H., Arora N. (2014), "Comparative Study of Plain X ray Abdomen, Ultrasonography and CT Diagnosis of Non-Traumatic Acute Abdomen", *International Journal of Medical And Applied Sciences*, Vol. 3, no. 4, p.p. 253-259.
- [2] Hardy. A., Bennet. B., & Crandal. M., (2013). "The Evaluation of the Acute Abdomen". In Moore. L. J., Turner. K. L., Todd. S. R., (Eds). *Common Problems in Acute Care Surgery* (Vol. 17, P. P. 20-31). New York: Springer Science.
- [3] Syed M. F., Nazish. N., Fatima B. Z. & Adeebul H. R. (2014) "Diagnostic Accuracy of Ultrasound and X ray KUB in Ureteric Colic, Taking CT as Gold Standard", *International Journal of Endorsing Health Science Research*. Vol 2, no 1, p.p 22-27.
- [4] Sharma P, Sidharth, Sing BP, Sing D and Gupta A (2010) "Comparative Study Between Plain Radiography and Ultrasound Abdomen in Non-Traumatic Surgical Acute Abdominal Conditions", *Nepalese Journal of Radiology*, Vol. 2, No 2, p.p 20-27.
- [5] Gupta K, Bhandari R. K, Chande R. (2005), "Comparative study of plain abdomen and ultrasound in non-traumatic acute abdomen", *Indian Journal, Radiology Imaging*, no 15, pp 15-109, cited in Sharma P. Sidharth, Singh B. P, Sing D, Gupta A [2010] "Comparative Study Between Plain Radiography and Ultrasound Abdomen in Non-Traumatic Surgical Acute Abdominal Conditions", *Nepalese Journal of Radiology*, Vol. 2, no3.
- [6] Prakash, Sharma, Sidharth, BP Singh, D Singh, A Gupta (2012) "Comparative Study of Plain Abdomen and Ultrasound in Non-Traumatic Acute Abdomen" *Nepalese Journal of Radiology*, Vol. 2, no 2, pp 20-27.
- [7] Choi. S. Y., Wong. T. W., Lau. C. C., Liang. E., Fu. Y. K., Khoo. J., (2002), "A Study on the use of abdominal x rays in the emergency department". *Hong Kong Journal of Emergency Medicine*, Vol.9, P. P. 30-33.
- [8] Aviral, Chana. S. R, Ahmad. I., (2005). "Role of Ultrasonography in the Evaluation of Children with Acute Abdomen in the Emergency set up", *Indian Association of Pediatric Surgery*, vol 10, no. 10.
- [9] Gupta. K, Bhandari R. K, Chander. R (2005) "Comparative Study of Plain Abdomen and Ultrasound in Non-Traumatic Acute Abdomen". *Indian Journal Radiologic Imaging*. Vol. 1, p.p. 109-115.
- [10] Scanlon. V., Tna. S., (2007). *Essentials of Anatomy and Physiology*. E. A. Davis Company, Philadelphia.