

## Ultrasonographic Evaluation of Acute Pelvic Pain in Female Patients

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### Abstract

Acute pelvic pain is a common emergency presentation among female patients. This study was done to identify its common causes and sonographic patterns in our local community. From June 2011 to December 2016, 94 female patients from Hadramout, Shabwa and Almahra governorates, aged between 13 and 45 years, who referred to Bahabara radiology center in Mukalla complaining of acute pelvic pain, were examined and evaluated using sonography with a deep frequency transducer (3.5-5 MHz). Their age groups and resulting sonographic findings were recorded and classified accordingly. The results showed that eighteen patients (19.15%) had negative or normal ultrasound results, while 76 (80.85%) had detectable cause, most of them at reproductive age group (81.58%), while only 18.42% adolescents. Ovarian cyst and its complications was the commonest cause among positive cases in both adolescents and reproductive age groups (29.79%) followed by pelvic inflammatory disease (17.02%), acute appendicitis (9.57%), nephrolithiasis and ureteric stone (7.45 %), ectopic pregnancy (5.32%), uterine myoma necrosis (4.25%), incarcerated inguinal hernia (3.19%), ovarian torsion (2.13%) and dermoid cyst (2.13%). We concluded that APP is more common among reproductive age group, and gynecologic causes were the most common in our study.

**Keywords:** Pelvic pain, gynecologic diseases, ovarian cyst, pelvic inflammatory disease, appendicitis.

### Introduction:

Acute pelvic pain is an extremely common symptom in female patients presenting to the emergency department (ED), urgent care centers and outpatient radiologic centers. Acute pelvic pain is generally defined as pain in the lower abdomen or pelvis lasting less than three months [4,17,18].

Acute pelvic pain can pose a diagnostic challenge because the clinical history, symptoms, and physical examination findings are often nonspecific, and the clinical presentations of the underlying gynecologic, obstetric, urologic, and gastrointestinal conditions often vary widely and can frequently overlap [35]. The selection of imaging in the evaluation of acute pelvic pain is determined by the clinically suspected differential diagnosis after careful evaluation.

The American College of Radiology Appropriateness Criteria list pelvic sonography as the preferred first-line imaging modality in the evaluation of acute pelvic pain in pregnant and nonpregnant women of reproductive age, when an obstetric or gynecologic condition is suspected, and also in the initial assessment of a suspected nongynecologic conditions in a pregnant patient [5].

Pelvic ultrasonography is usually the imaging modality of choice because of a lack of radiation exposure, easy accessibility, offers widespread availability, low cost and high sensitivity [4,17].

It should be performed in most cases and is the initial imaging modality of choice in evaluation of pelvic pain in female patients, and in acute abdominal pain in general [20,32,35]

The results of this procedure therefore, play a pivotal role in directing the patient to surgical or medical consultation or just watchful waiting. A correct diagnosis at an earlier, less complicated stage could possibly save the patient from a catastrophic outcome. The person performing the ultrasound exam therefore should have a firm understanding of the general symptomatology behind the various etiologies of pelvic pain [31,36.]

The spectrum of differential diagnosis that can be obtained from ultrasound evaluation of pelvic pain including gynecologic sources of pelvic pain like: functional and hemorrhagic ovarian cysts, pelvic inflammatory disease, ruptured ovarian cyst, endometriosis, adnexal torsion, ectopic pregnancy, fibroid uterus necrosis and dermoid cyst, and also nongynecologic sources of acute pelvic pain that include: acute appendicitis, inguinal hernia (incarceration and strangulation), ureteric stone and urine retention and others [30,33].

The purpose of this study is to identify the common causes of female pelvic pain and their sonographic pattern in our local community, in order to manage this frequent health problem properly.

### Patients and methods:

The study was conducted in Bahabara radiological center in Mukalla- Hadramout-Yemen, over a period from first of June 2011 to

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end of December 2016, and included ninety four (94) female patients, aged from 13 to 45 years from Hadramout, Almahra and Shabwa governorates, who complained from acute pelvic pain and were referred by their physicians for ultrasound examination and evaluation of the cause.

All patients, irrespective of diagnosis and motivations for ultrasonography, underwent ultrasonographic examination of pelvic organs and lower abdominal structures using a grey scale ultrasound machine with a 3.5 MHz curvilinear electronic convex probe (Toshiba famio 5- japan, siui and SonoAce 8000SE color doppler machine- south Korea). All sonographic examinations were performed on real time and color Doppler modes at different planes including longitudinal and transverse scans .

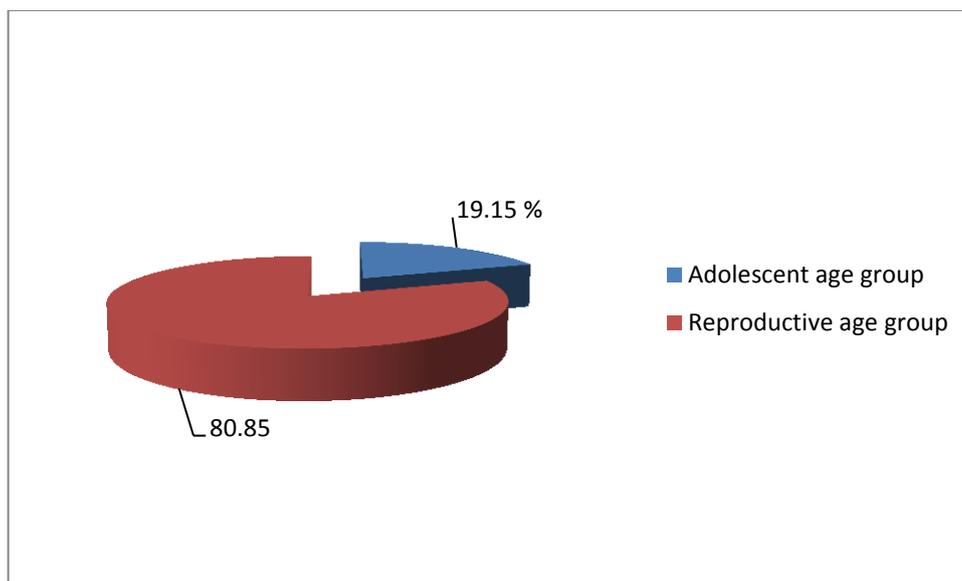
Trans-abdominal technique was the standard ultrasound technique used, using the fluid-filled urinary bladder as it displaces bowel and becomes an acoustic window, which allow good visualization of uterus, ovaries, and different pelvic and lower abdominal structures. The

patients were made to lie in the supine position and examined in both longitudinal and transverse planes for full assessment of pelvic organs and nearby lower abdominal structures .

Patients were classified according to age into two groups: adolescents (from 13 to 18 years) and reproductive age (from 19 to 45 years), and according to sonographic findings into two main categories: normal and abnormal, and the abnormal group is further classified according to the different pathologies that causing their acute pelvic pain into: gynecologic and non-gynecologic causes, and by aiding of color Doppler property of the machine, can easily differentiate the ultrasonic behavior of those different etiologies.

**Results:**

The mean age of the 94 cases with acute pelvic pain (APP) was  $28.84 \pm 6.53$  years. Eighteen (19.15%) of them were at adolescent age group, and 76 (80.85%) were at reproductive age group as shown in Figure 1.

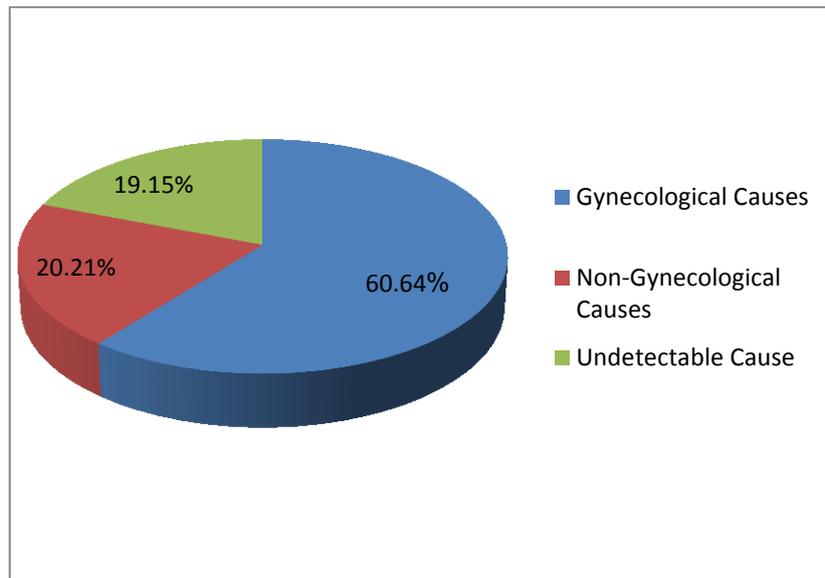


**Fig. 1: Percentage of the two age groups**

Out of the 94 patients we found undetectable cause or negative ultrasound result in 18 patients (19.15%), of them four cases at adolescent age group and 14 cases at reproductive age group as appear in table 1 .

The positive ultrasound results in which the cause of pain was detected represented 80.85%

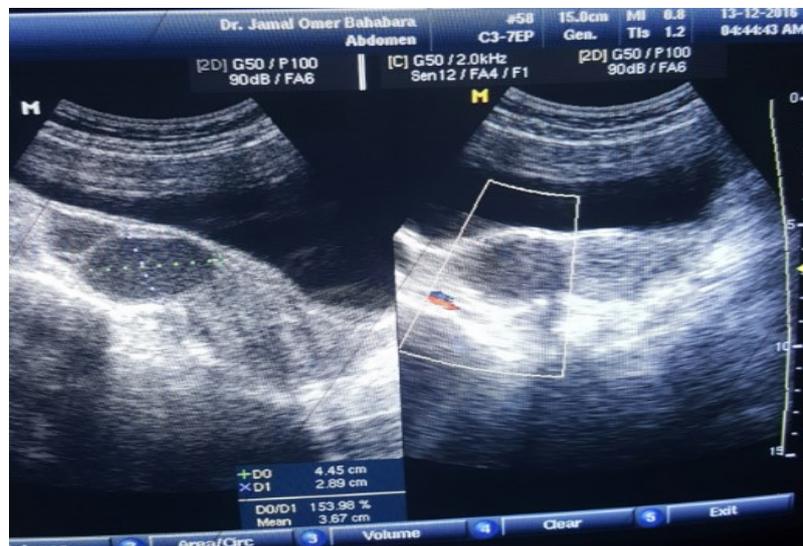
(76 cases; 14 (18.42%) adolescents, 62 (81.58%) reproductive age), 57 of them had gynecologic causes representing 60.64% (seven adolescents, 50 reproductive age), while 19 (20.21%) had non-gynecological cause (seven adolescents, 12 reproductive age) (Fig. 2):



**Fig. 2: Categorical classification of ultrasonic causative results of women with acute pelvic pain**

disease (PID) (16 cases, 17.02%), then ectopic pregnancy (five cases, 5.32%) (Image 2), uterine myoma necrosis (four cases, 4.25%), ovarian dermoid cyst and adnexal torsion (two cases, 2.13% for each one) but those found only in reproductive age group.

Six gynecologic causes found in this study, with ovarian cyst and its complications (enlarged size, hemorrhagic, ruptured) was the most common cause of APP in general and among gynecological causes, in both adolescent and reproductive age groups (28 cases, 29.79%) (Image 1), followed by pelvic inflammatory



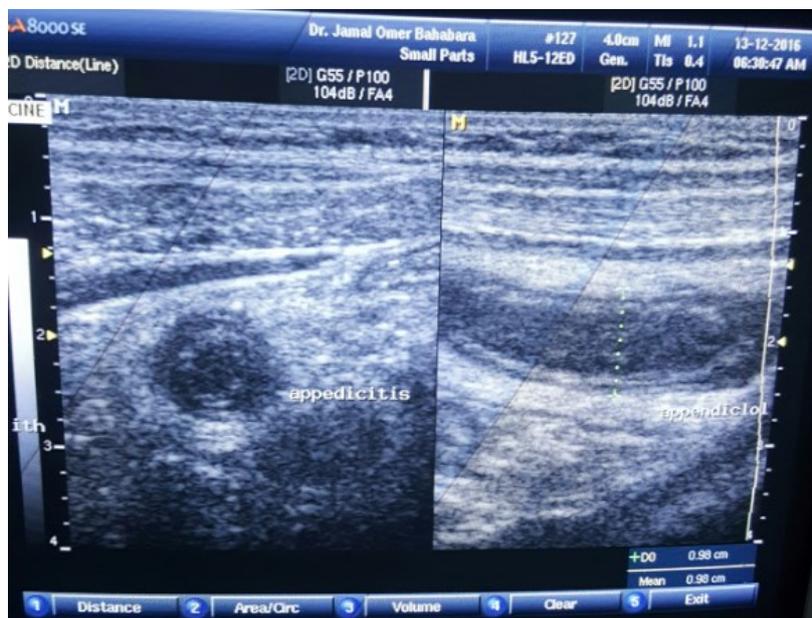
**Image 1: Transabdominal ultrasound shows cystic lesion with reticular pattern but no internal vascularity- Hemorrhagic cyst.**



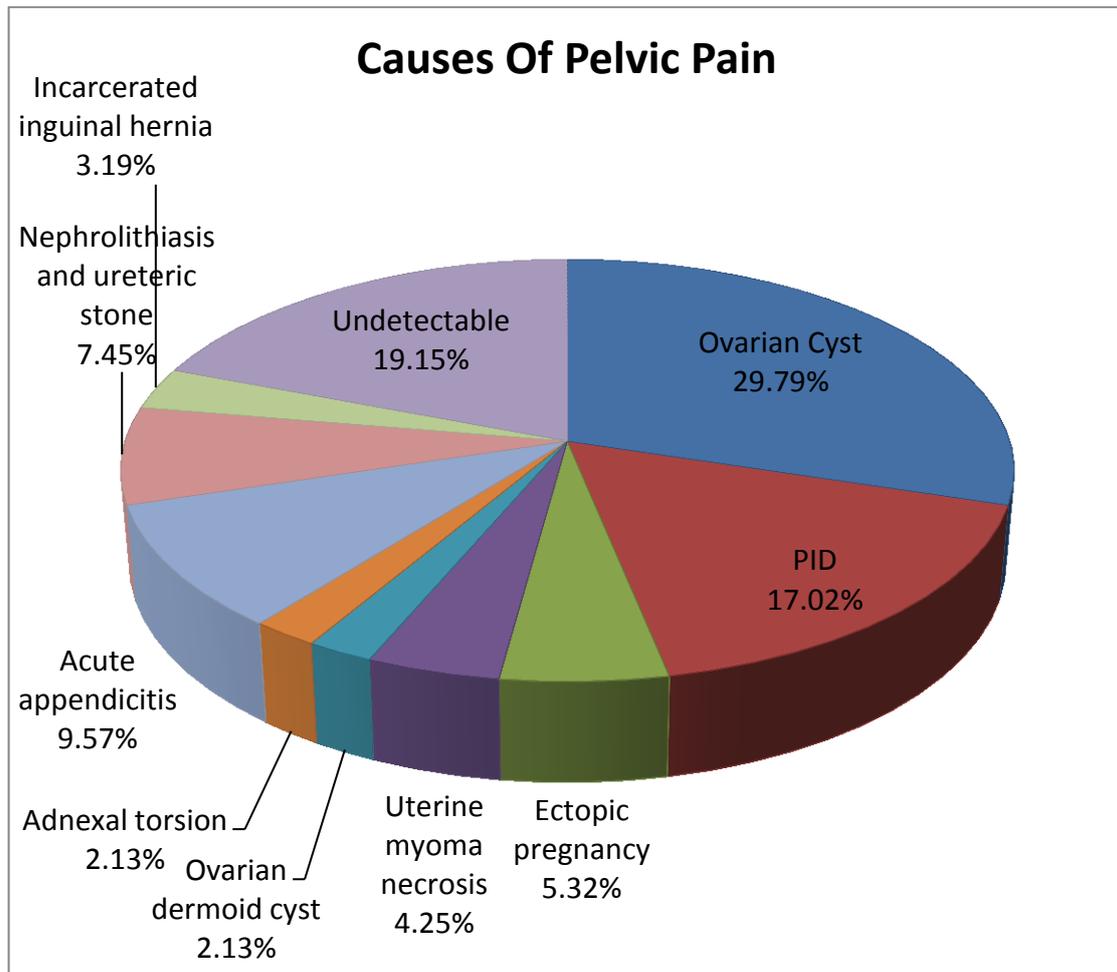
**Image 2: Transabdominal ultrasound image shows adnexal gestational sac containing an embryo- Ectopic pregnancy**

Acute appendicitis was the commonest non-gynecologic cause in our study (9.57%) in both adolescent (five cases) and reproductive age group (four cases) (Image 3), followed by

nephrolithiasis and ureteric stone (seven cases, 7.45%) then incarcerated inguinal hernia (three cases, 3.19%) which seen only in the reproductive age group (Fig. 3):



**Image 3: Ultrasonic image in transverse and longitudinal scans shows enlarged appendix with thick wall and dilated lumen (acute appendicitis).**



**Fig. 3: Percentage of different causes of acute pelvic pain detected by ultrasound**

Detailed distribution of patients according to causative process and age groups is shown in table 1 below:

**Table1. Classification of women with APP according to age groups and causes**

Cause of acute pelvic pain	Adolescents	Reproductive Age	Total	(%)
<b>Gynecological causes:</b>				
1) Ovarian cyst (enlarged size, hemorrhagic and ruptured cyst)	7	21	28	29.79%
2) PID	0	16	16	17.02%
3) Ectopic pregnancy	0	5	5	5.32%
4) Uterine myoma necrosis	0	4	4	4.25%
5) Ovarian dermoid cyst	0	2	2	2.13%
6) Adnexal torsion	0	2	2	2.13%
<b>Non gynecological causes:</b>				
1) Acute appendicitis	5	4	9	9.57%
2) Nephrolithiasis and ureteric stone	2	5	7	7.45%
3) Incarcerated inguinal hernia	0	3	3	3.19%
<b>Undetectable</b>	4	14	18	19.15%
<b>Total</b>	18 (19.15%)	76 (80.85%)	94	100%

**Discussion:**

The clinical diagnosis of acute pelvic pain in the female patient can be challenging because of nonspecific signs and symptoms, and imaging has been found to be valuable in narrowing the differential diagnosis. Most critical etiologies that require urgent care are gynecologic problems, therefore sonography is the imaging modality of choice because many gynecologic/obstetric causes of pelvic pain are easily diagnosed on ultrasound examination [10]. And even differentiating a benign from a malignant adnexal mass was found to be useful by using ultrasound and color Doppler studies with scoring system [29].

In our study, gynecologic causes of acute pelvic pain in female patients were more commoner than non-gynecologic causes in both adolescents and reproductive age groups, with the most common cause is functional ovarian cyst and its complications (enlarged follicle, hemorrhagic or ruptured cyst), which constituted near one third of cases, followed by pelvic inflammatory disease then ectopic pregnancy which seen only in reproductive age group. Acute appendicitis was the commonest cause of non-gynecologic causes in both age groups, and was the third common cause in reproductive age group and the second one in adolescents, followed by ureteric stone.

In the literature, it was largely agreed that gynecological causes of pelvic pain in women were commoner than non-gynecologic, and somewhat similar results were obtained from evaluation of 503 females with acute pelvic pain in an Iranian study, in which APP was most commonly observed in the reproductive period, and adnexal pathologies and infections were etiologically prominent [19].

According to Kruszka, the common acute pelvic pain causes in women were the same in several old studies presented in his article, but their frequency differ from study to study, as some studies stated that ovarian cyst and its complications was the commonest cause as in our study, others found that pelvic inflammatory disease was commoner, while others found that acute appendicitis (non-gynecologic cause) was the commoner cause [18].

Choudhary et al. analyzed 177 cases of acute gynecological emergencies in tertiary care hospital, and also concluded that ovarian cyst and its complications was the most common gynecological cause of acute pelvic pain, followed by ectopic pregnancy then other causes

[9]. They also found that APP is common among reproductive age group similar to our study and other related studies .

In contrast, Jearwattanakanok et al. studied the acute lower abdominal pain in women of reproductive age, and found that appendicitis constituted the commonest cause followed by gynecological causes [15]. This variation was depending on the sample study, age group of patients and study place and conditions .

Significant ratio of undetectable cause, which could be related to a non-specific pelvic pain or pathology that was not detected by ultrasound, is found in our study (19.15%) and also in those related studies [6,15,18,19]. For those cases, CT scan may be more valuable for detecting the underlying cause, and MRI could be used in pregnant women [5,8,23,28]. Ovarian torsion, dermoid cyst, degenerating fibroids and incarcerated inguinal hernia were found in our study, but occurred less frequently, and seen only in the reproductive age group.

Functional ovarian cysts can occur in any age, but are common in women of reproductive age, and rare after menopause [2]. They are non-neoplastic lesions of the ovary which may be simple or hemorrhagic. The sonographic appearance of a functional cyst without hemorrhage is that of a thin-walled, unilocular, smooth-bordered cyst that contain anechoic fluid [16]. The classic sonographic appearances of a hemorrhagic cyst is the "lace-like" or "spider-web" pattern of internal reticulation. These fine septations are avascular on color Doppler imaging, and are not true tissue septations, but represent fibrin strands that form as the blood clot hemolyses [1,14,26].

Pelvic inflammatory disease (PID) refers to a spectrum of infectious processes in the pelvis, typically ascending from cervix (cervicitis) to involve the upper reproductive organs: the uterus (endometritis), fallopian tubes (salpingitis), and ultimately, the ovaries [13,30].

Sonographic findings of early stage of PID in patients are usually very subtle and not easily detectable with ultrasonography; enlargement of the uterus and ovaries, indistinct soft tissue margins, thickening of the broad ligament and tubes, and fluid within the endometrial cavity or cul-de-sac. As the disease progresses and involvement of the fallopian tubes persists, tubal sonographic findings are some of the most specific hallmarks of PID, including the dilated, fluid-filled, folded, and tubular structures in the adnexae which are the key findings in

hydro/pyosalpinx, along with the characteristic appearance of tubo-ovarian complex and tubo-ovarian abscess [11,13,30,34]

Ectopic pregnancy refers to the implantation of a fertilized ovum outside the uterine cavity. A clinical presentation of abdominal or pelvic pain, vaginal bleeding, and an adnexal mass in a woman with a positive  $\beta$ -HCG level and associated risk factors should raise the suspicion of an ectopic pregnancy [27]. It is useful to know a quantitative beta HCG prior to scanning as this will guide what you expect to see on ultrasound. At levels <2000 IU, a normal early pregnancy may not be visible [21,22].

Appendicitis, the most common cause of nongynecologic pain, can be diagnosed by ultrasonography with a sensitivity (in several studies) and specificity ranged from 67% to 88% and 78% to 100%, respectively, compared with sensitivity and specificity of CT of 76% to 96% and 75% to 97% respectively. A positive diagnosis on ultrasonography can be made when a distended, noncompressible, tubular, blind-ending structure with a wall-to-wall diameter greater than 6 mm is visible [7,12,24,25].

Finally, when one considers the different organs located in the pelvis and the abdominal cavity

whose pain may be referred to the pelvis, ultrasound is the key investigative tool for such vast differential diagnosis because of its high sensitivity, low cost, wide availability, and lack of ionizing radiation, particularly when a gynecologic disorder is suspected as the underlying cause [3], and other causes not found in our study can also be evaluated and diagnosed, considering CT scan and MRI for cases in which the cause is not detected by ultrasound.

#### **Conclusion:**

Acute pelvic pain in females is a broad-spectrum, resulting from a wide-range gynecologic and non-gynecologic causes, some of them requiring urgent surgical management. As a radiation-free and relatively inexpensive imaging modality, ultrasound is the first-line imaging modality of choice for acute pelvic pain. The referral for CT or MR imaging should be considered if the ultrasound is nondiagnostic.

In our study, APP is more common among reproductive age group, and gynecologic causes were the most common, of them ovarian cyst and its complication was the commonest cause, followed by pelvic inflammatory disease and ectopic pregnancy, while acute appendicitis was the commonest non-gynecological cause.

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## تقويم الألم الحوضي الحاد عند المرضى الإناث عن طريق الفحص بجهاز الموجات فوق الصوتية

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### الملخص

الألم الحوضي الحاد هو حالة مرضية طارئة شائعة بين النساء و هذه الدراسة أجريت لتحديد أسبابه الشائعة في مجتمعنا المحلي وانماطه الظاهرة بالموجات فوق الصوتية. من يونيو 2011 إلى ديسمبر 2016، تم تحويل 94 مريضة من محافظات حضرموت وشبوة والمهرة، تتراوح أعمارهن بين 13 و 45 سنة، إلى مركز باحبارة التشخيصي- المكلا لأنهن يشكين من ألم الحوض الحاد، وتم فحصهن باستخدام جهاز التصوير بالموجات فوق الصوتية بواسطة ترانزديوسر ذي تردد عميق ( 3.5-5 ميقاهيرتز). و قد تم تصنيف المرضى حسب الفئة العمرية ووفقا لنتائج الفحص. وكانت نتيجة الفحص بالموجات فوق الصوتية ل 18 مريضة (19.15%) سلبية، في حين أن 76 (80.85%) لديهن سبب تم اكتشافه، أكثرهن في الفئة العمرية الإيجابية (81.58%) بينما فقط 18.42% من فئة المراهقين. كيس المبيض ومضاعفاته كان السبب الأكثر شيوعا بين الحالات الإيجابية في كل من المراهقين ومجموعة السن الإيجابي (29.79%) يليه مرض التهاب الحوض (17.02%)، التهاب الزائدة الدودية الحاد (9.57%)، حصوات الكلى والحالب (7.45%)، الحمل خارج الرحم (5.32%)، ونخر ورم الرحم الليفى (4.25%)، الفتق الإربي (3.19%)، التواء المبيض (2.13%) وكيس الديرمويد (2.13%). وقد خلصنا الى أن الألم الحوضي الحاد كان أكثر شيوعا في الفئة العمرية الإيجابية، و الأسباب المتعلقة بالأمراض النسائية هي الأكثر شيوعا في دراستنا.

**الكلمات المفتاحية:** ألم الحوض، أمراض النساء، كيس المبيض، مرض التهاب الحوض، التهاب الزائدة الدودية.