

ORIGINAL ARTICLE

Sonographic Evaluation of Pelvic Pain in Gravid and Non-Gravid Uterus

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ABSTRACT

Aim: To evaluate sonographically pelvic pain and contribution of pelvic ultrasound in diagnosing pelvic pathologies in females with gravid and non-gravid uterus.

Study Design: Cross-sectional analytical study

Place and Duration: Sami Diagnostic and Waraich Ultrasound center Jauharabad (Khushab). Duration of study was 9 months.

Methodology: Convenient sampling technique was used and 100 patients were enrolled. Toshiba Xario and Hitachi Aloka ultrasound machines were used. Study included females with gravid uterus, nongravid uterus, and those with pelvic pain present and also with absent pain. It excluded females with non-gynecological complaints. Both transabdominal and transvaginal ultrasound modalities were used. Longitudinal, transverse and oblique views were taken. Based on sonographic findings, diagnosis was made and image recorded. SPSS version 22.0 was used for data analysis.

Results: In patients with gravid uterus pelvic pain was present in 23 (67.6%) and absent in 11 patients (32.4%). In non-gravid uterus pelvic pain was present in 64 (97.0%) and absent in 2 (3.0%). Most common finding was Intramural uterine fibroid (12%) with pain present in 8 and absent in 4 patients followed by hemorrhagic ovarian cyst HOC (10%) with pelvic pain present in 9 and absent in 1, simple ovarian cysts (7%) caused pelvic pain in 7 patients and in subserosal fibroid (6%) pelvic pain was present in 4 patients and absent in 2 patients. 10% females were presented with pelvic pain but showed normal ultrasound findings.

Conclusion: Ultrasound is modality of choice to determine the pelvic pathologies in females. Pelvic pain was present more in non-gravid females. Most incident etiology causing pelvic pain was intramural fibroids. Age factor is one of the most effecting factors for the pelvic pain in gravid uterus.

Keywords: Ultrasound, Pelvic pain, Fibroids, Hemorrhagic ovarian cyst, Ovarian cyst

INTRODUCTION

In females pelvic pain is a common although nonspecific condition which may be due to multiple causes including gynecologic, urologic, gastrointestinal, musculoskeletal, vascular, and metabolic causes. The prevalence of pelvic pain in outpatient gynecologic consultations is 2% to 10% and 20% of patients with pelvic pain undergoes laparoscopies¹. The prevalence rate of noncyclical pelvic pain for Pakistan is 8.8%². Obstetric and nonobstetric causes of pelvic pain are subcategories of gynecologic causes of acute pain. Therefore, determining the patient's pregnancy using a b-human chorionic gonadotropin (hCG) level is the initial step in evaluating a premenopausal woman with acute pelvic pain. Large ovarian cysts, ruptured or hemorrhagic cysts, pelvic inflammatory disease (PID), ovarian or adnexal torsion, and displaced intrauterine devices are common gynecologic causes of pelvic pain in non-pregnant females. Endometritis, retained products of conception (RPOCs), ovarian vein thrombophlebitis, and uterine rupture are some of the postpartum conditions that can cause pelvic pain³. The women of child bearing age are more susceptible to have acute pelvic pain and is difficult to diagnose as its indications are broad. In nongravid women differential diagnosis of pelvic pain is extensive. So, imaging plays crucial role in the diagnosis⁴. Ultrasound examination is the most favorable imaging technique in case gynecological cause is suspected as it is an extension of bimanual examination, easily available and affordable and is not linked with ionization radiation¹. When a gynecological cause is suspected of a woman's pelvic pain, ultrasound (US) in both of its modalities transabdominal and transvaginal is the imaging method of choice. Transabdominal ultrasound requires optimal urinary bladder filling for better view of the uterine fundus, the high-positioned adnexa, and the potential for intraperitoneal free fluid or hemorrhage. Following bladder voiding, transvaginal US uses a high frequency endovaginal probe, enabling a precise evaluation of the endometrium and adnexal tissues⁵. There are many adnexal causes of pelvic pain, and precise diagnosis is crucial to distinguish between those that require immediate

surgical intervention and those that may be treated medically or with expectant management. The successful management of patients with certain disorders, such as ovarian torsion or PID and TOA, depends on the quick beginning of the proper medication⁶.

Pelvic pain is a disease that affects a large number of women and may interfere with their usual activities and quality of life. The determination of cause of pelvic pain in pregnant and non-pregnant women can be challenging because many signs and symptoms are not specific and may overlap with each other. Interpretation of imaging findings with reference to clinical signs can help to diagnose causes of pelvic pain much earlier and facilitates early treatment without delay thus decreases the morbidity. Aim of this study is to evaluate the contribution of pelvic ultrasound in diagnosing pelvic pathologies in females with gravid and non-gravid uterus.

METHODOLOGY

This cross-sectional analytical study was conducted at Sami Diagnostic Centre and Warraich Ultrasound Diagnostic Centre Jauharabad (Khushab). Two ultrasound machines Toshiba Xario and Hitachi Aloka were used. Ultrasound was performed by using two probes, a convex probe of 3.5-5 MHz and trans-vaginal probe of 5-7.5 MHz. Convenient sampling technique was used and 100 patients were enrolled. Duration of study was 9 months. Study included females with gravid uterus, nongravid uterus, and those with pelvic pain present and also with absent pain. It excluded females with non-gynecological complaints.

Patients with the gynecological complaints were asked for pelvic ultrasound. Patients were asked to lie in a supine position. The ultrasound coupling gel was applied to the abdomen. Both transabdominal and transvaginal ultrasound modalities were used. Each patient first underwent a transabdominal examination with a sufficiently distended bladder. Patients were then asked to void the urinary bladder and then transvaginal scanning was done. Longitudinal, transverse and oblique views were taken. All areas of the pelvis were examined including uterus, cervix, vagina, fallopian tubes and ovaries. Based on sonographic findings, diagnosis was made and image recorded. Data was tabulated and analyzed with the help of SPSS version 22 and was reported using descriptive

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statistics.

RESULTS

Total 100 patients were enrolled in the study. Mean age calculated was 32.9 years (SD =9.75).

The results shows that in patients with gravid uterus pelvic pain was present in 23(67.6%) and absent in 10 patients (32.4%) while 64(97%) patients were presented with pelvic pain and 2(3%) with absent pelvic pain in the non-gravid uterus. Gravid uterus has no missing values but in non-gravid uterus, there is a one missing value.

Table 1: Uterus Pelvic Pain Crosstabulation

| Uterus | Pelvic Pain | | Total |
|------------|-------------|---------|-------|
| | absent | present | |
| gravid | 10 | 23 | 33 |
| non gravid | 2 | 63 | 66 |
| Total | 13 | 100 | |

Table-I illustrates the percentage of pelvic pain present or absent in patients with gravid/non gravid uterus.

This study also includes the sonographic findings and concludes that the most common finding was Intramural uterine fibroid (12%) with pain present in 8 and absent in 4 patients followed by hemorrhagic ovarian cyst HOC (10%) in which 9 patients were presented with pelvic pain and 1 was without pain, simple ovarian cysts (7%) caused pelvic pain in all 7 patients and in sub serosal uterine fibroid (6%) pelvic pain was present in 4 patients and absent in 1 patient, functional cyst (5%) with pain present in 3 patients and absent in 2 patients, endometriotic cyst (4%) with pelvic pain present in all 4 patients, adenomyosis (5%) with pelvic pain present in all 5 patients, endometrial polyp (4%) with pelvic pain present in all 4 patients, polycystic ovaries (3%) with pelvic pain in 3 patients and pain absent in none. In cystic hyperplasia (3%) pelvic pain was present in all 3 patients, complex ovarian cyst (2%) caused pain in 1 patient and 1 patient was without pain, physiologic cyst (3%) caused pelvic pain in all 3 patients. In

Table 3: Descriptive Statistics

| | N | Range | Min. | Max. | Mean | Std. Error | Std.Deviation | Variance | Skewness | Std. Error | Kurtosis | Std. Error |
|---------------------|-----------|-----------|-----------|-----------|-----------|------------|---------------|-----------|-----------|------------|-----------|------------|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic | Statistic |
| Age | 100 | 53 | 12 | 65 | 32.94 | .976 | 9.756 | 95.188 | .544 | .241 | .324 | .478 |
| Valid N (list wise) | 100 | | | | | | | | | | | |

Table 4: Statistical description of gravid and non-gravid uterus. a. Age is constant when Uterus= . It has been omitted.

| Descriptives ^a | Uterus | Statistic | Std. Error | | | |
|---------------------------|-------------|----------------------------------|-------------|----------------------------------|-------------|-------|
| Age | gravid | Mean | 30.09 | .985 | | |
| | | 95% Confidence Interval for Mean | Lower Bound | 28.08 | | |
| | | | Upper Bound | 32.10 | | |
| | | 5% Trimmed Mean | | 30.08 | | |
| | | Median | | 30.00 | | |
| | | Variance | | 32.023 | | |
| | | Std. Deviation | | 5.659 | | |
| | | Minimum | | 20 | | |
| | | Maximum | | 40 | | |
| | | Range | | 20 | | |
| | | Interquartile Range | | 9 | | |
| | | Skewness | | .224 | .409 | |
| | | Kurtosis | | -.806 | .798 | |
| | | non gravid | non gravid | Mean | 34.33 | 1.365 |
| | | | | 95% Confidence Interval for Mean | Lower Bound | 31.61 |
| | Upper Bound | | | 37.06 | | |
| 5% Trimmed Mean | | | | 34.08 | | |
| Median | | | | 34.00 | | |
| Variance | | | | 123.056 | | |
| Std. Deviation | | | | 11.093 | | |
| Minimum | | | | 12 | | |
| Maximum | | | | 65 | | |
| Range | | | | 53 | | |
| Interquartile Range | | | | 17 | | |
| Skewness | | | | .276 | .295 | |
| Kurtosis | | | | -.299 | .582 | |

ovarian dysfunction (2%) Bilocular ovarian cyst (1%) and follicular cyst (1%) caused no pelvic pain as no patient was presented with pain at the time of scan and patients with PID (1%), TOA (1%) , dermoid cyst (1%), patient with free fluid in cul de sac (1%), incomplete septate uterus (1%), endometritis (1%), displaced IUCD (1%), abdomen gossipyboma (1%), multiple fibroids (1%), retroverted uterus (1%), small for age uterus, intracavitary fibroid (1%), paraovarian cyst (1%) and pedunculated fibroid (1%) were presented with pain in pelvic region and none of them were with absent pelvic pain. 10% females showed normal ultrasound findings and all of them were presented with pelvic pain at the time of scan.

Table 2: Chi-square test a. 6 cells (66.7%) have expected count less than 5. The minimum expected count is .01

| | Value | df | Asymptotic Significance (2-sided) |
|--------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 21.550 ^a | 4 | .000 |
| Likelihood Ratio | 19.486 | 4 | .001 |
| N of Valid Cases | 100 | | |

Chi-square test

Using the chi-square independence test, researchers can determine if two categorical variables are related in a given population. However, if the factors are independent across the board in the population, there is little chance that a substantial correlation will exist in the sample.

Statistics show that there is a relationship. A Pearson chi-square test was done to determine the significance of this association. The association between two variables is statistically significant if Asymptotic Significance (2-sided) < 0.05 which is clearly the case here. Significance is often referred to as “p”, short for probability; it is the probability of observing sample outcome if the variables are independent in the entire population. This probability is 0.000 in this case. These results reject the null hypothesis that these variables are independent in the entire population. Pearson chi-square test shows the value of 21.550. Degree of freedom in Pearson chi-square is 4. The number of valid cases is 100.

Descriptive statistics are brief informational coefficients that summarize a given data set, which can be either a representation of the entire population or a sample of a population. Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include standard deviation, variance, minimum and maximum variables, kurtosis, and skewness.

The mean and median of gravid uterus are 30.09 and 30.00 while in non-gravid uterus the mode and median are respectively 34.33, 34.00. The median is the figure situated in the middle of the data set. It is the figure separating the higher figures from the lower figures within a data set. The minimum value for pelvic pain in gravid uterus is 20 and maximum is 40. While the minimum and maximum values for non-gravid uterus are 12, 65. Standard error in gravid uterus is .985 and 1.365 in non-gravid uterus. There is difference in standard deviation of both gravid and non-gravid uterus that is 5.659 and 11.093.

Descriptive statistics are broken down into measures of central tendency and measures of variability (spread). Measures of central tendency include the mean, median, and mode, while measures of variability include standard deviation, variance, minimum and maximum variables, kurtosis, and skewness.

Table 5: Statistical description of pelvic pain with respect of age. a. Age is constant when Pelvic Pain = It has been omitted.

| Pelvic Pain | | Statistic | Std. Error | | | | |
|---------------------|--------|----------------------------------|-------------|----------------------------------|-------------|-------|--|
| Age | absent | Mean | 30.46 | 2.034 | | | |
| | | 95% Confidence Interval for Mean | Lower Bound | 26.03 | | | |
| | | | Upper Bound | 34.89 | | | |
| | | 5% Trimmed Mean | 30.62 | | | | |
| | | Median | 30.00 | | | | |
| | | Variance | 53.769 | | | | |
| | | Std. Deviation | 7.333 | | | | |
| | | Minimum | 16 | | | | |
| | | Maximum | 42 | | | | |
| | | Range | 26 | | | | |
| | | Interquartile Range | 12 | | | | |
| | | Skewness | -.158 | .616 | | | |
| | | Kurtosis | -.235 | 1.191 | | | |
| | | present | present | Mean | 33.45 | 1.080 | |
| | | | | 95% Confidence Interval for Mean | Lower Bound | 31.31 | |
| | | | | | Upper Bound | 35.60 | |
| | | | | 5% Trimmed Mean | 33.11 | | |
| | | | | Median | 30.00 | | |
| | | | | Variance | 100.392 | | |
| Std. Deviation | 10.020 | | | | | | |
| Minimum | 12 | | | | | | |
| Maximum | 65 | | | | | | |
| Range | 53 | | | | | | |
| Interquartile Range | 14 | | | | | | |
| Skewness | .517 | | | .260 | | | |
| Kurtosis | .216 | | | .514 | | | |

The mean and median of pelvic pain absence in patients is 30.46 and 30.00 while presence of pelvic pain shows the mode and median of respectively 33.45, 30.00. The median is the figure situated in the middle of the data set. It is the figure separating the higher figures from the lower figures within a data set. The minimum value for pelvic pain absence is 16 and maximum is 42. While the minimum and maximum values for presence of pelvic pain are 12, 65. Standard error in absence of pelvic pain is 2.034 and 1.080 in presence of pelvic pain. There is difference in standard deviation of absence and presence of pelvic pain that is .333 and 10.020.

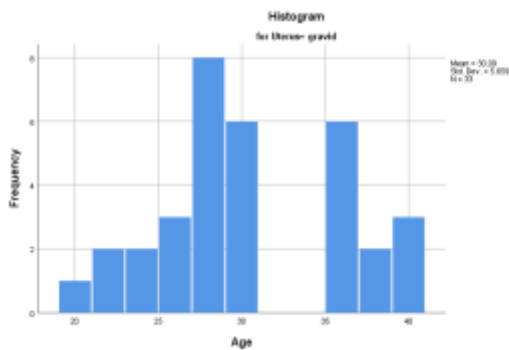


Figure 1: Histogram shows frequency for gravid uterus

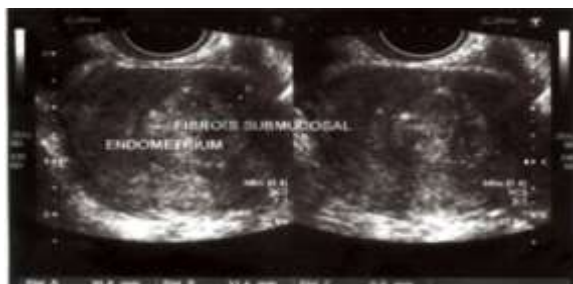


Figure-2: Trans-vaginal grey scale image showing submucosal uterine fibroid measuring 32x30 mm

Discrete or continuous data are summed using a histogram. To put it another way, it offers a visual representation of statistical information by displaying the proportion of data points that fall inside a given range of values (referred to as "bins"). In histogram, x-axis shows age of patients and y-axis shows frequency for gravid uterus. It shows that at the age of 28-29, patients are more susceptible to gravid uterus pelvic pain and at the age of 30 and 35 the chances of being affected was also more but less than at the age of 28-29. The chances of pelvic pain in gravid uterus were significantly increased with increase in age factor.



Figure-3: Trans-abdominal grey scale image showing right hemorrhagic ovarian cyst measuring 39x39x45 mm.

DISCUSSION

According to American College of Radiology criteria, Ultrasound is primary choice of imaging in patients with acute pelvic pain due to being nonradioactive, harmless, and easy to use with quick results and having good visualization of pelvic organs. Transabdominal and trans-vaginal ultrasound can be used to evaluate patients with pelvic pain. Acute pelvic pain is nonspecific and can be confused with other diseases in term of symptoms and findings⁷. Careful evaluation of uterus and adnexa is important for evaluation of various causes of pelvic pain⁸. In this study premenopausal, perimenopausal and postmenopausal patients were evaluated. Results showed that most of the patients presented with pelvic pain were premenopausal in context of menstrual status i.e. 80 % patients were premenopausal. 12% women who were around their menopause (perimenopausal) were presented with pelvic pain and postmenopausal women evaluated were 8%. This study exhibits the pathologies which can cause pelvic pain in female patients with nongravid uterus and were evaluated by ultrasound. Upon data analysis, the most common sonographic findings causing pelvic pain were intramural uterine fibroids (12%), and hemorrhagic ovarian cysts (10%). This is correlated with the study conducted by Kamlesh Gupta et al in 2015 which showed that in adnexal pathologies causing pelvic pain hemorrhagic ovarian cysts are more common comprising 50 % pathologies of acute pelvic pain⁹. This is also correlated well with the past study conducted in 2002 which showed that hemorrhagic ovarian cyst and salpingitis are more commonly diagnosed adnexal pathologies in patients with pelvic pain⁸. Study conducted in 2021 at Kawempe National Referral hospital enrolled females of reproductive age complaining of pelvic pain ranged in age from 15 to 49 years. Simple adnexal cysts were the most common ultrasonographic manifestation of pelvic discomfort (30.66%), followed by hypoechoic solid masses in the uterus (uterine fibroids), which were seen in 26.67% of cases. This demonstrates the need of treating uterine fibroids and simple adnexal cysts in patients appropriately to reduce or eliminate the risk of complications¹⁰. Other findings of our study were subserosal fibroid (8%), simple ovarian cyst (8%), submucosal fibroid (6%), functional cyst (5%), adenomyosis (4%), endometriotic cyst (4%), endometrial polyp (3%), polycystic ovaries (3%), cystic hyperplasia (2%), and ovarian complex cyst (2%). It is

correlated with the study of Sandra O. Allison et al in 2010 which shows that acute pelvic inflammatory disease, functional ovarian cysts, ovarian endometriomas and adnexal torsion are the gynecological disorders diagnosed in women with negative pregnancy test and who were presenting with pelvic pain¹¹. P Basnet et al in Bharatpur from 2018 to 2019 conducted a study which included 48 female patients of reproductive age with acute pelvic pain who were not pregnant. The study found that ovarian cysts, of which 20.8% were hemorrhagic cysts, were the most frequent cause of acute pelvic pain, followed by corpus luteal cysts (14.58%) and endometriomas (12.50%). When diagnosing a female patient with acute pelvic pain, ultrasound is extremely important. It supports quick evaluation and quick decision-making for operational planning. In this study both ultrasound modalities i.e., transabdominal and transvaginal were used to diagnose the pelvic pathologies in female¹². A study conducted in Kerbala, Iraq in January 2020 to February 2021 at the ultrasound clinic correlated well with our study and it showed that both transabdominal and transvaginal probes were employed and convenient sampling was used to collect patient information. The age incidence of the patients in this study ranged from 18 to 45 years, with a mean patient age of 29.67 years. The most prevalent lesion in cases of acute pelvic discomfort, occurring in 35.1% of cases, is a simple ovarian cyst. Hemorrhagic ovarian cysts are the second leading cause in 27.1% of cases, and uterine fibroids are the third leading cause in 10.2% of cases. 4.9% of cases had normal ultrasound findings¹³. Bahabara JO et al. enrolled 94 female patients aged 13 to 45 with complaints of acute pelvic pain. The results showed that 76 patients (80.85%) had a detectable cause, the majority of whom were in the reproductive age range (81.58%), while only 18.42% of the patients were teenagers. Eighteen patients (19.15%) had negative or normal ultrasound results. The most frequent cause of positive cases in both adolescence and the reproductive age groups was an ovarian cyst and its consequences (29.79%), followed by pelvic inflammatory disease (17.02%)¹⁴.

CONCLUSION

The findings of our study concluded that ultrasound is a valuable imaging modality to evaluate and diagnose the pelvic pathologies in females in gravid and non-gravid uterus. Pelvic pain was present more in non-gravid females. Most incident etiology causing pelvic pain was intramural fibroids. The hemorrhagic ovarian cysts found to be the second common disorder. Present study concludes that the women who were at the age of between 28-30 was more frequently susceptible of pelvic pain in gravid and non-gravid uterus and less frequently affected at the age of 20-25. Age factor

is one of the most effecting factors for the pelvic pain in gravid uterus. It is compulsory to accurately diagnose the symptoms of these diseases to avoid an increase in the rate of pelvic pain in non-gravid uterus of females.

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Recommendation: There are no recommendations to address.

Ethics approval and consent to participate: Written informed consent has been taken from the patients to participate in the study.

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Authors' contributions: Hira Rashad, wrote the manuscript and collected the data, Syeda Khadeja, Interpret the results and contributed in study conception and design, Muhammad Yousuf Farooq, performed the data analysis

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