Original Article

Ultrasound for Identifying Gynecological and Obstetrical Etiologies of First-Trimester Pelvic Pain

Fatima Batool[1*], Mujahida[1], Asma Shakeel[1], Momina Shahid[1], Sayyam Jameel[1], Rida Aslam[1] and Asim Raza[1]

[1]School of Allied Health Sciences, Combined Military Hospital Lahore, Medical College and Institute of Dentistry, Lahore, Pakistan

ARTICLE INFO

ABSTRACT

For well-being of mother and fetus timely and accurate diagnosis is necessary. Pregnant patients frequently presented with pain and discomfort in the first trimester of pregnancy due to multiple gynaecological and obstetrical causes. **Objective:** To identify the gynecological and obstetrical causes of first-trimester pelvic pain using ultrasound. **Methods:** This retrospective, descriptive cross-sectional study was done after obtaining ethical approval from the Institutional Review Board (IRB). Data collection was done retrospectively from Al-Jannat Lab, Lahore. Patient's medical record of six-month period from April 2023 to September 2023 was reviewed. The data collection was done during time period of November 2023 to January 2024. Data analysis was done on SPSS version 26.0. **Results:** In this study, retrospective data were collected of 86 patients. Transvaginal Ultrasonography (TVUS) was performed on 43 patients (50.0%) Transabdominal Sonography (TAS) was done on 26 patients (30.2 percent), whereas both scanning techniques were used in 17 cases. Gynaecological causes of pelvic pain detected during first trimester of pregnancy were Pelvic Inflammatory Disease, Endometriosis, Ovarian Cyst, Fibroids and Adnexal Torsion whereas Obstetrical causes of pelvic pain were Ectopic Pregnancy, Sub chorionic Hemorrhage, Molar Pregnancy, Heterotopic Pregnancy and Miscarriage. **Conclusions:** Ultrasound identifies a variety of gynecological and obstetrical causes as a first-line diagnostic tool for pelvic pain in early pregnancy and helps in better patient management and avoids undue interventions

INTRODUCTION

Pelvic pain is pain in the lowest part of the torso, in the region below the abdomen and in the space between the hipbones (pelvis). The pain may come and go and be sharp or crampy (like menstrual cramps. Pregnant women frequently experience Pelvic Pain (PP), which can be caused by several diseases, including obstetric, gynaecological, gastrointestinal, genitourinary, and vascular disorders [1]. Lower back pain and pelvic pain are common pregnancy symptoms and have a wide range of reported incidences (24–90%) therefore; a "crampy" pelvic pain in early pregnancy is common and is caused by the uterus's quick growth, hormonal changes, and increased blood flow. Pregnant patients frequently express discomfort in the first trimester due to symptoms that are normal on diagnostic examinations [2]. Pregnancy-related pain can be caused by a wide range of disorders. Gynaecological (adnexal torsions, pelvic inflammatory disease, endometriosis, ruptured ovarian cysts) and obstetrical (miscarriage, ectopic pregnancy, subchorionic hematoma) conditions can be divided as the primary causes of pelvic pain in pregnancy [3]. Approximately 10-12% of known first trimester pregnancies undergo spontaneous abortions. Ectopic pregnancy is most commonly tubal (97%), although it can also be ovarian (1%), interstitial (3%), abdominal (<1%), or cervical (<1%) there are three kinds of placental hematoma: retro placental, sub chorionic and sub amniotic [3]. Retro placental hematomas, posterior to the placenta, form 43% of hematomas, whereas sub chorionic hematomas, between the chorion and the endometrium, represent roughly 57%.

Sub amniotic ones, positioned between the amnion and the chorion, are uncommon around the world, uterine leiomyomas and uterine fibroids are the most prevalent gynecological tumors, affecting 20–50% of women [3, 4]. The safety of the mother and fetus should always come first when selecting the best diagnostic equipment for a pregnancy emergency disease assessment. Due to the known risks of ionizing radiation exposure to the developing fetus, Ultrasound (US) and Magnetic Resonance Imaging (MRI) are currently the preferred imaging techniques [5]. Ultrasound is quick, painless, produces extensive results, is widely accessible, and is regarded as safe. This modality is the first-line examination for the patients who are pregnant because it doesn't require for the administration of intravenous contrast material (agent) [5]. Pelvic scans are a general term for imaging tests used to examine the organs and structures within the pelvis [6]. There are two main ways an ultrasound can be performed for a pelvic scan: Transabdominal ultrasound: A probe is placed on abdomen to send sound waves through the tissues to pelvic organs. Transvaginal ultrasound: A thin probe is inserted into the vagina to get a closer look at the uterus, ovaries, and cervix [7, 4]. Ultrasonography is a non-invasive imaging method that has been shown to be beneficial in the diagnosis of a variety of gynecological and obstetric problems. Nevertheless, it is still uncertain if ultrasonography in evaluating the first trimester pelvic pain is completely feasible.

This study aimed to address this knowledge gap by employing strategic usage of ultrasonography to identify the underlying gynecological and obstetric reasons of pelvic pain in early pregnancy, and presenting evidence-based references for assessing and treating pregnant women. Moreover, this study may help in the elimination of unnecessary surgeries and therapies by accurately finding benign sources of pain

METHODS

This retrospective, descriptive cross-sectional study was done after obtaining ethical approval from the Institutional Review Board (IRB) with case number of 651/ERC/CMH/LMC. Data were collected retrospectively from Al-Jannat Lab, Lahore. Patient's medical record of six-month period from April 2023 to September 2023 was reviewed. The data collection was done during time period of November 2023 to January 2024. All the detailed history was collected including the age, duration of pain and associated symptoms. Informed consent was taken from each participant all possible benefits and expected risk were explained. Female with pelvic pain in first trimester of pregnancy and between ages of 18-35 years were included. Females with ggastrointestinal diseases, urinary tract infection and pelvic vascular diseases were excluded. Examination was done with Toshiba Xario and Logic 5

Ultrasound machine, Tran's abdominal transducer (2-5MHz), Tran's vaginal transducer (5-12MHz) of LOGIC 5 PRO. Both trans-abdominal and trans-vaginal scanning techniques were used for ultrasound examinations. Firstly, transabdominal scan was performed for all the participants , if the initial diagnosis were not clear, further Transvaginal Ultrasound (TVS) was performed. TVS was also done as a first line investigation in those patients prescribed by gynecologists. All the data were written on proforma and evaluated from SPSS version 26.0. Data were analyzed at 95% of confidence-interval. Mean and standard deviation were computed for quantitative variables in the descriptive analysis, whereas frequencies and percentages were computed for qualitative data.

RESULTS

The data were collected from total of 86 pregnant patients with 1st trimester. Table 1 displays the demographic characteristics of pregnant women during the first trimester, specifically focusing on two variables: Age Group (Years) and Weeks of Pregnancy. While frequencies of Obstetrical and gynaecological causes of pelvic pain in pregnant women of first trimester diagnosed on ultrasonography as shown in table 3 and table 4.

Table 1: Demographic Characteristics of Pregnant Women of First Trimester (n=86)

Variables	Categories	(%)
Age Group (Years)	18-23	17.44%
	24-29	44.18%
	30-35	38.37%
Weeks of Pregnancy	1-4	15.1%
	5 to 8	40.7%
	9 to 12	44.2%

Table 2 showed the various scanning techniques employed on pregnant women during the first trimester.

Table 2: Types of Scanning Techniques Performed on the Pregnant Women of First Trimester (n=86)

Scanning Technique	(%)
Trans-Abd US	30.23%
Tarns-Vaginal US	50%
Both	19.76%

While frequencies of Obstetrical and gynaecological causes of pelvic pain in pregnant women of first trimester diagnosed on ultrasonography, as shown in table 3.

Table 3: Frequency of Obstetrical Causes of Pelvic Pain in Pregnant Women (N=86) Of First Trimester Diagnosed On Ultrasonography

Variables	Responses	(%)	Types	(%)
Ectopic Pregnancy	Yes	93.02	–	–
	No	6.98	Tubal	4.7
			Ovarian	1.2

Variables	Responses	(%)	Types	(%)
			Previous Caesarean Scar	1.2
Sub chorionic Hemorrhage	Yes	88.37	-	-
	No	11.63	Mild	9.3
			Moderate	2.3
			Severe	0
Molar Pregnancy	Yes	98.8	-	-
	No	41.16	Complete	0
			Partial	1.2
Heterotopic Pregnancy	Yes	98.84	-	-
	No	1.16	Intrauterine and Tubal Ectopic	1.2
			Intrauterine and Ovarian Ectopic	0
			Intrauterine and Cervical Ectopic	0
			Intrauterine and Caesarean Scar	0
Miscarriage	Yes	75.58	-	-
	No	24.42	Incomplete	4.7
			Complete	1.2
			Missed	18.6

Table 4 presented the frequency of gynecological causes of pelvic pain in 86 pregnant women during their first trimester, as diagnosed through ultrasound examinations.

Table 4: Frequency of Gynaecological Causes of Pelvic Pain in Pregnant Women of First Trimester Diagnosed On Ultrasonography(n=86)

Variables	Responses	(%)	Types	(%)
Pelvic Inflammatory Disease	Yes	90.7	-	-
	No	9.3	Mild	0
			Moderate	5.8
			Severe	3.5
Endometriosis	Yes	96.51	-	-
	No	3.49	-	-
Ovarian Cyst	Yes	73.26	-	-
	No	26.74	Right	17.4
			Left	8.1
			Bilateral	1.2
Fibroids	Yes	75.58	-	-
	No	24.42	-	-
			Sub Mucosal	10.5
			Sub Serosal	8.1
			Pan Mural	2.3
			Pedunculated	3.5
Adnexal Torsion	Yes	100	-	-
	No	0	-	-

DISCUSSION

This study showed that ultrasound is effective in diagnosing a variety of conditions (e.g., pelvic inflammatory disease, ectopic pregnancy, miscarriage) that could be sources of pelvic pain. Our study population likely differed in age distribution compared to the research by Guena MN *et al.*, in 2019, where the average participant age was 30 years. This reinforces the importance of considering age when interpreting results, as pelvic pain presentations in pregnancy can vary across age groups.

While our study identified a lower percentage of miscarriages (24.42%) compared to their 29.8%, the incidence of incomplete abortions (18.6%) aligned closely with their findings (22.3%). Notably, our study comparatively revealed a higher prevalence of ectopic pregnancies of which 6 were reported (4 tubal and 1 ovarian). This difference could be as a result of sample size differences or the pattern of referrals at the institution. One of the case (1. 2%) recalled having a scar on lower abdomen area as a result of a previous C–section, which was not stated in the mentioned study of Guena MN [8-13]. From the above findings, it can be noted that pelvic pain is complex in nature and a comprehensive diagnostic model is required for its analysis. In addition to the objective measurement of sonographic characteristics, patient's data such as history or age must also be considered [13]. Endometriomas during pregnancy were observed in 3 patients out of 86 of the studied group of women. Although their occurrence is relatively rare, several concerns are raised due to possible difficulties. It has been reported in a previous study that most endometriomas either diminish in size or become asymptomatic with time but, about 2. 8 % of pregnant women may experience a rupture of endometrioma. This is in concord with our focus on possible causes of pelvic pain, as endometrioma may get ruptured in the patient and might consequently be painful. In addition, they noticed that there is an increased chance of developing ovarian torsion due to larger endometriomas. Ovarian torsions are considered a serious complication that demand immediate medical procedures. However, no such case was identified in our study [14]. Different authors have also reported percentage prevalance of fibroids during the first trimester. When compared to a study by Tîrnovanu MC, where 68% cases of fibroids were found, our results indicated a significantly reduced figure of fibroids (24. 4%). This difference may correlate to differences in the demographic parameters, rates of diagnosis, or research methods. Further research should be carried out to determine the reasons that lead to this fluctuation and to have a refined first-trimester prevalence rate of fibroids [15]. The usage of ultrasonography has been described in several studies to provide excellent accuracy in diagnosing diverse causes of pelvic pain [16, 17]. These studies highlight the advantages of ultrasonography over other imaging techniques. Such benefits include safety for pregnant women and the ability to provide real-time image of the pelvic organs. Altogether, our results regarding the efficacy of transvaginal ultrasound in the acquisition of clearer images for particular conditions are confirmed by a previous study that emphasized its importance for evaluating complex cases [18-21]. This research underlines the significance of using ultrasonography for diagnosing the pelvic pain at the initial stage. By determining several gynecological and obstetrical aspects, this study will assist

in the management of the patient so that unnecessary strategies are not applied. Data were obtained and recorded after the outcome variables were gathered so the impact of the confounder variables was not evaluated. Furthermore, the relatively small sample size might limit the generalizability of the findings. Future studies should be done prospectively with a larger sample size. Furthermore, investigating the relationship between certain ultrasound findings and pain intensity could provide significant information.

CONCLUSIONS

Ultrasound identifies a variety of gynecological and obstetrical causes as a first-line diagnostic tool for pelvic pain in early pregnancy and helps in better patient management and avoids undue interventions.

Authors Contribution

Conceptualization: FB
Methodology: MS, SJ
Formal analysis: AR
Writing, review and editing: M, AS, RA, AR

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1]   Galan HL, Huguelet T, editors. Emergencies in Obstetrics and Gynecology, an Issue of Obstetrics and Gynecology Clinics, E-Book: Emergencies in Obstetrics and Gynecology, an Issue of Obstetrics and Gynecology Clinics, E-Book. Elsevier Health Sciences; 2022 Sep. doi: 10.1016/S0889-8545(22)000 71-7.

[2]   Caruso M, Dell'Aversano Orabona G, Di Serafino M, Iacobellis F, Verde F, Grimaldi D *et al.* Role of ultrasound in the assessment and differential diagnosis of pelvic pain in pregnancy. Diagnostics. 2022 Mar; 12(3): 640. doi: 10.3390/diagnostics120306 40.

[3]   Masselli G, Brunelli R, Monti R, Guida M, Laghi F, Casciani E *et al.* Imaging for acute pelvic pain in pregnancy. Insights into Imaging. 2014 Apr; 5: 165-81. doi: 10.1007/s13244-014-0314-8.

[4]   Chai Y, Boudali AM, Walter WL. Correlations analysis of different pelvic tilt definitions: a preliminary study. HSS Journal®. 2023 May; 19(2): 187-92. doi: 10.1177/155 63316221136128.

[5]   Detti L, Francillon L, Christiansen ME, Peregrin-Alvarez I, Goedecke PJ, Bursac Z *et al.* Early pregnancy ultrasound measurements and prediction of first trimester pregnancy loss: A logistic model. Scientific Reports. 2020 Jan; 10(1): 1545. doi: 10.1038/s41598-020-58114-3.

[6]   Flusberg M, Kobi M, Bahrami S, Glanc P, Palmer S, Chernyak V *et al.* Multimodality imaging of pelvic floor anatomy. Abdominal Radiology. 2021 Apr; 46: 1302-11. doi: 10.1007/s00261-019-02235-5.

[7]   Collins SA, O'Shea M, Dykes N, Ramm O, Edenfield A, Shek KL *et al.* International Urogynecological Consultation: clinical definition of pelvic organ prolapse. International Urogynecology Journal. 2021 Aug; 32(8): 2011-9. doi: 10.1007/s00192-021-04875-y.

[8]   Curry A, Williams T, Penny ML. Pelvic inflammatory disease: diagnosis, management, and prevention. American Family Physician. 2019 Sep; 100(6): 357-64.

[9]   Marcinkowski KA, Mehta V, Mercier R, Berghella V. Pelvic inflammatory disease in pregnancy: a systematic review focusing on perinatal outcomes. American journal of obstetrics & gynecology MFM. 2022 Jul; 4(4): 100643. doi: 10.1016/j.ajogmf.2022.100 643.

[10]   Hasson J, Tsafrir Z, Azem F, Bar-On S, Almog B, Mashiach R *et al.* Comparison of adnexal torsion between pregnant and nonpregnant women. American Journal of Obstetrics and Gynecology. 2010 Jun; 202(6): 536-e1. doi: 10.1016/j.ajog.2009.11.028.

[11]   Sasaki KJ and Miller CE. Adnexal torsion: review of the literature. Journal of Minimally Invasive Gynecology. 2014 Mar; 21(2): 196-202. doi: 10.1016/j.jm ig.2013.09.010.

[12]   Chill HH, Karavani G, Rachmani T, Dior U, Tadmor O, Shushan A. Growth pattern of uterine leiomyoma along pregnancy. BioMed Central Women's Health. 2019 Dec; 19: 1-5. doi: 10.1186/s12905-019-0803-5.

[13]   Guena MN, Alapha FZ, Kemegne DC, Nana AN, Zeh OF, Fotsing JG. Ultrasound study of first trimester bleeding. Open Journal of Radiology. 2019 Jan; 9(1): 58-68. doi: 10.4236/ojrad.2019.91006.

[14]   Woźniak A and Woźniak S. Ultrasonography of uterine leiomyomas. Menopause Review/Przegląd Menopauzalny. 2017 Dec; 16(4): 113-7. doi: 10.5114/pm.2017.72754.

[15]   Tîrnovanu MC, Lozneanu L, Tîrnovanu ŞD, Tîrnovanu VG, Onofriescu M, Ungureanu C *et al.* Uterine fibroids and pregnancy: a review of the challenges from a Romanian Tertiary Level Institution. InHealthcare. 20 22 May; 10(5): 855. doi: 10.3390/healthcare1005085.

[16]   Shaamash AH, Aly HA, Abdel-Aleem M, Akhnowkh SN. Clinical and ultrasound evaluation of early threatened miscarriage to predict pregnancy continuation up to

28 weeks: a prospective cohort study. Journal of Ultrasound in Medicine. 2020 Sep; 39(9): 1777-85. doi: 10.1002/jum.15282.

[17] Takami M, Kajiyama R, Miyagi E, Aoki S. Characteri stics of ovarian endometrioma during pregnancy. Journal of Obstetrics and Gynaecology Research. 2021 Sep; 47(9): 3250-6. doi: 10.1111/jog.14862.

[18] Nawrocka-Rutkowska J, Szydłowska I, Ryl A, Ciećwież S, Ptak M, Starczewski A. Evaluation of the diagnostic accuracy of the interview and physical examination in the diagnosis of endometriosis as the cause of chronic pelvic pain. International Journal of Environmental Research and Public Health. 2021 Jun; 18(12): 6606. doi: 10.3390/ijerph18126606.

[19] Roditis A, Florin M, Rousset P, Touboul C, Bendifallah S, Bazot M *et al.* Accuracy of combined physical examination, transvaginal ultrasonography, and magnetic resonance imaging to diagnose deep endometriosis. Fertility and Sterility. 2023 Apr; 119(4): 634-43. doi: 10.1016/j.fertnstert.2022.12.025.

[20] Liu L, Li W, Leonardi M, Condous G, Da Silva Costa F, Mol BW *et al.* Diagnostic accuracy of transvaginal ultrasound and magnetic resonance imaging for adenomyosis: systematic review and meta-analysis and review of sonographic diagnostic criteria. Journal of Ultrasound in Medicine. 2021 Nov; 40(11): 2289-306. doi: 10.1002/jum.15635.

[21] Huang CC, Huang CC, Lin SY, Chang CY, Lin WC, Chung CH *et al.* Association of pelvic inflammatory disease (PID) with ectopic pregnancy and preterm labor in Taiwan: a nationwide population-based retrospec tive cohort study. PLOS One. 2019 Aug; 14(8): e02193 51. doi: 10.1371/journal.pone.0219351.