

## The Use of Ultrasound in the Evaluation and Differential Diagnosis of Pregnancy-Related Pelvic Pain

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Received: 11-08-2023 / Revised: 12-09-2023 / Accepted: 23-10-2023

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Conflict of interest: Nil

### Abstract

**Background:** Pregnant women often have pelvic pain (PP), which can be brought on by a number of illnesses, such as vascular, gynecological, gastrointestinal, and obstetric conditions. The mother's and the fetus's health depend on an early diagnosis, correct treatment, and both. These are quite difficult, though. Pregnancy-related physiological changes should be taken into account as a potential source of diagnostic confusion. Since ultrasound (US) is commonly accessible, non-ionizing radiation is used, and it is the first-line imaging modality in this situation. When there is suspicion of an ectopic pregnancy, US may be definitive in making the diagnosis if it finds no fetal cardiac activity. Similarly, when there is suspicion of acute appendicitis, US may reveal a dilated, peristaltic, and blind-ending tubular structure emerging from the cecum. It can be challenging to detect and manage acute pelvic pain in expectant and new mothers. The most often utilized imaging modality for assessing expectant and recent mothers is still ultrasound.

**Aim:** The aim of the study was to assess ultrasonography in evaluating several causes of pain in the pelvis during early pregnancy.

**Material and Method:** This cross-sectional investigation was carried out in the General Surgery Department. For the study, 200 individuals with pelvic pain during the first trimester who were admitted to the labor ward are chosen. Participants in the research are those who have complained of lower abdomen pain and have had amenorrhea for up to three months. A trans abdominal ultrasound equipment with two dimensions. It has been demonstrated that sonar, a non-invasive technique, is completely safe for the fetus even after repeated exposures at any phase of pregnancy. An ultrasonography was performed on these 200 patients who had complained of lower abdomen pain and had experienced amenorrhea for three months. Urine  $\beta$  HCG analysis was also conducted. Informed written consent was taken from the patients or their guardians willing to participate in the study.

**Results:** 200 patients with pelvic pain are reported; 20(31.4%) patients had bleeding, 20(16.9%) had fibroids out of 100 patients, 25(17.4%) had cysts and 12(5.5%) patients had an ectopic pregnancy, 100 patients were not counted for bleeding status in which 87(94.5%) patients had no ectopic pregnancy & 13 (5.5%) patients had an ectopic pregnancy. 100 patients were counted for bleeding status, in which 6 (5.6%) patients had ectopic pregnancy & 94(94.4%) patients had no ectopic pregnancy, 100 patients were not counted for bleeding status which 99 (99.6%) patients had no fibroids & 1(0.4%) patients had fibroids. 100 patients were count for bleeding status, in which 87(52.8%) patients had fibroids & 13(47.2%) patients had no fibroids.

**Conclusion:** It has been demonstrated that ultrasonography is a crucial diagnostic tool in obstetrics. It is a readily available diagnostic method that aids in the early detection of problems related to bleeding during the first trimester. It was shown to be crucial in the diagnosis of first-trimester hemorrhage in the aforementioned investigation. Relying solely on the patient's history and clinical findings may cause a delay in diagnosis, a number of difficulties, and an increase in the patient's morbidity.

**Keywords:** Pain Lower Abdominal, Early Pregnancy, First Trimester, Fibroid and Gestational Sac

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## Introduction

Pregnant patients with pelvic or lower abdominal pain in the first trimester are frequently seen in emergency rooms, urgent care facilities, and outpatient clinics. Early pregnancy often causes "cramps" in the form of pelvic pain because of uterine development spurts, hormonal changes, and increased blood flow. [1] Women usually complain of discomfort in the first trimester of pregnancy, and this aching can be extremely upsetting for them. and typical sonographic outcomes. [2] Vaginal bleeding and unilateral bleeding are typically connected. If the vessel is burst, symptoms of shock include pallor, sweating, cold extremities, palpation, pallor, palpitations, and an increase in heart rate and pulse. [3] The patient may disclose a history of amenorrhea, which lasted between six and ten weeks during her pregnancy. Patients who have had severe abortions, such as sepsis or incomplete abortions, may experience fever, hypotension, profuse vaginal bleeding, and severe lower abdominal pain. [4] During a pelvic exam, the uterus may feel palpable above the pubic area, and vaginal bleeding may be apparent in the vaginal or cervical os with or without visible conception products. [5] During pregnancy, pelvic pain (PP) is a relatively common condition sustained by various causes and characterized by different timing and intensity of clinic presentation. Lower back pain and PP are common symptoms during pregnancy defined as "recurrent or continuous pain for >one week from the lumbar spine or pelvis" with a wide range of reported incidences (24–90%). [6,7] As a result, an early pregnancy "crampy" PP is normal and linked to rapid uterine expansion, hormone changes, and increased blood flow. Pregnant patients frequently report experiencing unpleasant symptoms in the first trimester that correspond with normal results on diagnostic tests. [8] In pregnancy, acute pelvic pain (PPP) refers to a distinct illness characterized by the abrupt onset of abdominal pain of a certain intensity associated with a range of conditions, including obstetric, gynecologic, gastrointestinal, genitourinary, and vascular disorders. This potentially hazardous acute disease always poses diagnostic and treatment issues and does not appear at a certain week of pregnancy that is preferred. The presence of ambiguous or altered clinical symptoms that are masked by contemporaneous changes in the mother's physiology and anatomy is the most significant element determining this situation. [9,10] Moreover, during pregnancy, white blood cells count is typically elevated, achieving the range of 20–30,000 cells/ $\mu$ L at the end of the third trimester. [11] Both the mother and the fetus may be in danger if many of the reasons of stomach pain are not promptly diagnosed. [12,13] Imaging can speed up diagnosis and

provide clarity in a clinically unclear picture. Because ultrasound is readily available, portable, and emits no ionizing radiation, it is frequently utilized as the first diagnostic imaging method during pregnancy. However, due to the patient's body habitus, a narrow field of view, and the existence of covering tissues, examination of the intestine, pancreas, ureters, and mesenteric vasculature may be limited on ultrasonography. The mesenteric arteries, pancreas, and bowel can all be evaluated more closely when the air inside the colon is present. An ovarian torsion doppler may be difficult to use. [14] The ovary's vitality is shown by the existence of venous flow. The main imaging test used in the diagnostic assessment of a pregnant patient is the ultrasound. Both trans-abdominal and endovaginal techniques are frequently used to assess the uterus, ovaries, and other pelvic structures. [15] For pregnant women experiencing pelvic pain, ultrasonography is the recommended diagnostic method due to its noninvasiveness, predictability, and safety. Sonography can be used to diagnose missed abortions or other pelvic pain that occurs during or after pregnancy. The earliest sonographic indicator of pregnancy, a chorionic sac, shows a remarkable progression on ultrasonography to a fetus and heart activity. interpreting and identifying the ultrasonic characteristics to ensure a first-trimester pregnancy that is safe.

## Material and Methods

This cross-sectional investigation was carried out in the General Surgery Department. For the study, 200 individuals with pelvic pain during the first trimester who were admitted to the labor ward are chosen. Participants in the research are those who have complained of lower abdomen pain and have had amenorrhea for up to three months. A trans abdominal ultrasound equipment with two dimensions. It has been demonstrated that sonar, a non-invasive technique, is completely safe for the fetus even after repeated exposures at any phase of pregnancy. An ultrasonography was performed on these 200 patients who had complained of lower abdomen pain and had experienced amenorrhea for three months. A urine  $\beta$  HCG analysis was also conducted. Informed written consent was taken from the patients or their guardians willing to participate in the study.

## The Patients Were Followed Up Accordingly.

- Patients with ultrasound findings of Threatened abortion were followed up with repeat ultrasound examinations and then outcomes were studied.
- Patients with features of missed abortion and Blighted ovum in ultrasound examination were subjected to Digital evacuation and curettage.

- Patients with features of molar pregnancy in ultrasound examination were subjected to evacuation.
- Patients with findings of ectopic pregnancies underwent laparotomy.
- Patients with findings of delayed periods were discharged.
- Patients with findings of Low-lying placenta were followed up and repeat ultrasound examinations were done later.
- Patients with findings of ovarian cysts which were found to be functional cysts < 6cm in size were followed up.

This study covered all pregnant women with a history of early pregnancy patients. Patients with diabetes were also present. Patients who did not cooperate or showed no symptoms were not included. Age, the results of the ultrasound (age, bleeding, gestational sac, CRL, FHR, HC, fibroids, and molar pregnancy) were the variables used to collect the data. The transabdominal scanning approach was applied, together with Mind Ray Z5 and Toshiba Xario 100 ultrasound machines equipped with convex probes operating at 3-5 MHz. All of the above listed factors are documented in the unique case record form for each patient (CRF).

**Diagnostic Imaging in Pregnancy:** The primary criterion for selecting the best diagnostic instruments in the evaluation of urgent disorders during pregnancy is the protection of both the mother and the fetus. Due to the established hazards that ionizing radiation exposure poses to the developing foetus, ultrasonography (US) and magnetic resonance imaging (MRI) are currently the recommended imaging modalities. The US is generally accessible, quick, easy, painless, and regarded as safe. This modality is the first-line exam for pregnant women and does not involve the injection of intravenous contrast material. Nonetheless, US limitations such operator dependence, narrow field of view, and pregnant woman's changed body habitus must be recognized. Although many causes of stomach pain during pregnancy may also be properly detected by computed tomography (CT), the use of ionizing radiation on a pregnant or potentially pregnant patient always necessitates a cautious and

reasonable risk-benefit analysis. As a result, in order to minimize radiation exposure while maintaining image quality, specific protocols must be followed in addition to the usage of an automatic exposure control system. It's crucial to use diagnostic tools correctly. In an emergency situation, US stands for the first line of defense and offers information that helps radiologists make an early diagnosis, saving the mother's and the fetus' lives.

**Placental Abruption:** The exact etiology of placental abruption is unknown. Placental abruption is a relatively rare condition and accounts for 10–25% of prenatal deaths. For this reason, a prompt diagnosis and correct management are required. Most placental abruptions occur before 37 weeks of gestation. This condition is defined by the separation of the placenta from the myometrium in the uterus, the rupture of maternal vessel tears, and the consequent blood accumulation pushing the uterine wall away from the placenta. Symptoms range from asymptomatic condition to maternal shock, but vaginal bleeding and abdominal or PP often occur.

**Statistical Analysis:** Data were gathered during the designated time. For data analysis, data organization, and result compilation, the complete software SPSS version 2.4 has been applied.

### Result

In this table, 200 patients with pelvic pain are reported; 20(31.4%) patients had bleeding, 20(16.9%) had fibroids out of 100 patients, 25(17.4%) had cysts and 12(5.5%) patients had an ectopic pregnancy, 100 patients were not counted for bleeding status in which 87(94.5%) patients had no ectopic pregnancy

& 13 (5.5%) patients had an ectopic pregnancy. 100 patients were counted for bleeding status, in which 6 (5.6%) patients had ectopic pregnancy & 94(94.4%) patients had no ectopic pregnancy, 100 patients were not counted for bleeding status which 99 (99.6%) patients had no fibroids & 1(0.4%) patients had fibroids. 100 patients were count for bleeding status, in which 87(52.8%) patients had fibroids & 13(47.2%) patients had no fibroids.

**Table 1: This table shows the various outcome in patients in the First Trimester of pregnancy.**

Findings	Frequency and Percentage	
Age	23.77 + 5.319	
Bleeding	Yes	90 (31.4%)
	No	110 (68.6%)
	Total	200 (100.0%)
Fibroid	Yes	50 (16.9%)
	No	150 (83.1%)
	Total	200 (100.0%)
Cyst	Yes	55 (17.4%)

	No	145 (82.6%)
	Total	200 (100.0%)
Ectopic Pregnancy	Yes	15 (5.5%)
	No	185 (94.5%)
	Total	200 (100.0%)

Table 1: In this table, out of 200 patients; 110(68.6%) patients had no bleeding and 90(31.4%) patients had bleeding, 150(83.1%) patients had no fibroids and 50(16.9%) had fibroids out of 344patients, out of 200 patients 145(82.6%) patients had no cyst and 55(17.4%) had a cyst and 185(94.5%) patients had not ectopic pregnancy and

15(5.5%) patients had an ectopic pregnancy. out of 200 patients; 100 patients were not counted for bleeding status in which 184(82.2%) patients had no cyst & 16 (17.8%) patients had a cyst. 100 patients were count for bleeding status, in which 18(16.7%) patients had cyst & 82 (83.3%) patients had no cyst.

**Table 2: This table shows the Bleeding status in patients with First Trimester in pregnancy**

Bleeding		Ectopic pregnancy		Total
		No	Yes	
No	Count	87	13	100
	% Within Bleeding	94.5%	5.5%	100.0%
Yes	Count	93	7	100
	% Within Bleeding	94.4%	5.6%	100.0%
Total	Count	180	20	200
	% Within Bleeding	94.5%	5.5%	100.0%

Table 2: In this table, out of 200 patients; 100 patients were not counted for bleeding status of which 87(94.5%) patients had not ectopic pregnancy & 13(5.5%) patients had ectopic pregnancy. 100 patients were count for bleeding status, in which 6(5.6%) patients had ectopic pregnancy & 94(94.4%) patients had not ectopic pregnancy

**Table 3: Shows the Bleeding Cross tabulation format in the First Trimester of pregnancy**

*Bleeding Crosstabulation		Bleeding		Total
Causes of Pelvic Pain		Yes	No	
Corpus luteal cyst	Count	13	9	22
	% Within Diagnosis	69.0%	31.0%	100.0%
DermoidCyst	Count	10	7	17
	% Within Diagnosis	70.8%	29.2%	100.0%
Ectopic pregnancy	Count	10	5	15
	% Within Diagnosis	70.6%	29.4%	100.0%
Intramural Fibroid	Count	0	20	20
	% Within Diagnosis	0.0%	100.0%	100.0%
Submucosal Fibroid	Count	4	6	10
	% Within Diagnosis	20.0%	80.0%	100.0%
sub serosal fibroid	Count	0	21	21
	% Within Diagnosis	0.0%	100.0%	100.0%

Table 3: In this table, out of 200 patients; 22 patients were counted for corpus luteal cysts in which 13(69%) patients had no bleeding & 9 (31%) patients had bleeding, 17 patients were counted for dermoid cysts in which 10(70.8%) patients had no bleeding & 7(29.2%)patients had bleeding, 15 patients were count for ectopic pregnancy in which 10(70.6%) patients had no bleeding and 5(29.4%) patients had bleeding, 20 patients were count for intramural fibroids in which 20(100%) had bleeding, 10 patients were count for submucosal fibroids in which 4 (20%) patient had no bleeding and 6(80%) patients had bleeding and 21 patients were count for subserosal fibroids in which 21(100%) patients had bleeding. A significant

correlation was found between bleeding and pelvic pain.

### Discussion

Our research focused on determining how ultrasound screening can be used to assess pelvic discomfort in the first trimester for a variety of reasons. Ultrasonography is now a diagnostic tool used to determine the cause of pelvic pain in the early stages of pregnancy. An attempt was made to ascertain the function of ultrasonography in the current investigation. Information was gathered based on both quantitative and qualitative factors, such as the age, Patients aged 16 to 44 years old who had ultrasound results (Age, Pain, Bleeding, Gestational sac, CRL, FHR, HC, Fibroid, Molar

pregnancy) were included. The Hospital provided 200 patients' worth of data. SPSS was used to examine the data.

Reem Hasan et al., 2010 [16] characterized bleeding throughout the first trimester, excluding bleeding that happens during a miscarriage. The study included women who were 18 to 45 years old. Not only was the timing, heaviness, duration, color, and associated pain noted, but also the likelihood that it will repeat in future pregnancies. As to their research, approximately 25% of the subjects suffered from bleeding, although only 8% had severe bleeding. In 28% of cases of spotting and minor bleeding, there was a discomfort component. Fifty-four percent of heavy occurrences were associated with pain. Most of the sessions took place in the three days or less between weeks five and eight of the pregnancy. In 12% of bleeding women and 13% of non-bleeding women, miscarriage occurred. A history of miscarriage and fibroids were two maternal characteristics associated with bleeding.

Charu Chanana et al. 2017 [17] studied that the most common reason for vaginal bleeding in the first trimester was a normal early intrauterine pregnancy, although other possible reasons included spontaneous abortion and ectopic pregnancy. An ectopic pregnancy occurs in about 2% of all pregnancies and it's one of the primary causes of maternal death globally. Ultrasound imaging was really useful. This photo essay highlights sonographic signs and common mistakes in ectopic pregnancy diagnosis.

Venkatesh A. Murugan et al., 2020 [18] studied patients presenting for pregnancy. For verifying the existence of intrauterine gestation, assess pregnancy survival, gestational duration, and multiplicity, diagnose pregnancy-related issues, and identify ectopic pregnancy in the first trimester, a vaginal ultrasound is the best approach.

In Nyberg et al. 1988 [19] studies, the absence of a yolk sac or embryo ended in the termination of pregnancy with 100% specificity. It is on par with our study. The absence of fetal echo was diagnosed in 56 cases, all of which ended in termination with 100% specificity. Mantoni et al. 1981 [20] determined that the majority of patients (85%) with a low-lying placenta had viable pregnancies. In our study, 66% of patients with low-lying placenta had live-term babies.

Giovanni Delli Carpini et al. 2019 [21] looked at the impact of fetal gender on the development of fibroids during pregnancy was studied based on - HCG serum levels found in another study. 70 of the females had a girl fetus, and 87 had a male fetus, they found. Fibroid diameter increased steadily in both fetal genders prior to conception and during the second trimester of pregnancy. The mean SD

fibroid diameter of male fetuses rose during the third trimester, but that of female fetuses dropped. Fetuses carried by women had higher fibroid diameters, particularly during the first trimester and the early and second trimesters thereafter. Serum levels of HCG were higher in women who were pregnant with a female fetus. In both female and male pregnancies, there was a relationship found between the width of the fibroid and HCG levels. Our investigation yielded different results: 235 patients (99.6%) had no fibroids, while 1 patient (0.4%) had fibroids. 236 individuals were not counted for bleeding status. Among the 108 patients whose bleeding status was tallied, 51 (57.2%) had no fibroids and 57 (52.8%) had fibroids. [22]

J. de Haan et al. 2015 [23] studied. Adnexal masses are frequent throughout pregnancy. During pregnancy, ovarian cysts or masses should be accurately assessed to identify the patients. Both magnetic resonance imaging (MRI) and ultrasound are safe diagnostic techniques for differentiating between benign and malignant tumors. Treatment options, including surgical procedures, should be explored with each patient separately.

Because of the physiological changes that occur during pregnancy, identifying the reason of PP can be difficult. Imaging methods that don't use ionizing radiation should be chosen. Because of its widespread availability and lack of ionizing radiation, the US is crucial in this context. Therefore, radiologists must become well-versed in this area. Though it's not always available, MRI overcomes several limitations of the US, namely its small field of view and the existence of overlaying structures that interfere. In cases that are still open, CT is still a dependable method. Low-dose methods are required; typically, they expose the developing embryo to an average estimated dose that is less than the 50 mGy threshold.

### Conclusion

It has been demonstrated that ultrasonography is a crucial diagnostic tool in obstetrics. It is a readily available diagnostic method that aids in the early detection of problems related to bleeding during the first trimester. It was shown to be crucial in the diagnosis of first-trimester hemorrhage in the aforementioned investigation. This diagnosis made it possible to treat first-trimester pregnancies more quickly and effectively before any complications arose. Relying solely on the patient's history and clinical findings may cause a delay in diagnosis, a number of difficulties, and an increase in the patient's morbidity. Early diagnosis and treatment not only decreased mortality and morbidity but also shortened hospital stays for the patients. Numerous writers have demonstrated the safety, speed, and

high accuracy of pulsed echo ultrasonography as a diagnostic tool.

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