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BAHIR DAR UNIVERSITYCOLLEGE OF MEDICINE AND HEALTH SCIENCESSCHOOL OF MEDICINEDEPARTMENT OF CLINICAL RADIOLGY

THE PROPORTION OF ABNORMAL PELVIC ULTRASOUND FINDING AND ITS ASSOCIATAED FACTORS AMONG REPRODUCTIVE AGE WOMEN PRESENTING WITH PELVIC PAIN AT TIBEBE GHION COMPREHENSIVE SPECIALIZED HOSPITAL, BAHIR DAR, NORTH WEST ETHIOPIA, 2026

BY: Dr. ALEMU TEBEBU (FINAL YEAR RADIOLOGY RESIDENT)

A THESIS TO BE SUBMITTED TO THE DEPARTMENT OF RADIOLOGY, COLLEGE OF MEDICINE AND HEALTH SCIENCES, BAHIR DAR UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE SPECIALITY CERTIFICATE IN CLINICAL RADIOLOGY

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The proportion of abnormal pelvic ultrasound finding and its associated factors among reproductive age women presenting with pelvic pain in Tibebe Ghion Comprehensive Specialized Hospital, Bahir Dar, North west, Ethiopia

By: Dr. Alemu Tebebu (final year radiology resident)

A thesis to be submitted to the department of radiology, college of medicine and health sciences, Bahir Dar university in partial fulfillment of the requirement for the speciality certificate in clinical radiology

February, 2026
Bahir Dar university

DECLARATIONFORM

I declare that this is my original work, has not been presented for this or any other university and that all sources of materials used for this thesis have been fully acknowledged.

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iv

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ABBREVIATIONS AND ACRONYMS

CT	Computed tomography
US	Ultrasound
G.C	Gregorian calendar
ED	Emergency department
TGCSH	Tibebe Ghion compressive specialized hospital
ED	Emergency department
OPD	outpatient department
CPP	Chronic pelvic pain
APP	Acute pelvic pain
TVS	Transvaginal Sonography
MRI	Magnetic Resonance Imaging
TOA	Tubo- ovarian abscess

Table of Contents

ACKNOWLEDGMENT v
ABBREVIATIONS AND ACRONYMS vi
List of tables and figures ix
List Tables ix
List of figure ix
Abstract x
1. INTRODUCTION 1
1.2 Background 1
1.2 Statement of The Problem 3
1.3 Significance of the study 6
2. LITERATURE REVIEW 7
2.1 Pelvic Pain in Reproductive-Age Women 7
2.2 Ultrasoundfindingsand etiologies in pelvic Pain: evidence from diverse settings: 8
2.7 Determinants of abnormal ultrasound findings 9
2.8 Gaps in the literatures 10
3. CONCEPTUAL FRAMEWORK 11
4. OBJECTIVES 12
4.1 General objectives 12
4.2 Specific objectives 12
5. METHODS AND MATERIALS 13
5.1 Study Design 13
5.2. Study area and period 13
5.3 Population 13
5.4**Inclusion and Exclusion Criteria** 13
5.5 Sample size estimation 14
5.6. Sampling method 14
5.7 Study Variables 15
5.7.1 Dependent variable 15
5.8 Operational definition: 15
5.9 Data Collection methods 16
5.9.1 Data Collection Procedure 16

5.10 Data analysis and processing methods 17
5.11 Data quality assurance 17
5.12ethical consideration 17
6. RESULTS 19
6.1. Socio-demographic characteristics 19
6.2. clinical characteristics among study participants 21
7. DISCUSSION 25
7.1 Proportion of Abnormal Pelvic Ultrasound Findings 25
7.2 Distribution of abnormal pelvic ultrasound findings 25
7.3 Factors associated with abnormal ultrasound findings 26
8. STRENGTH AND LIMITATION OF THE STUDY 27
9. CONCLUSION 28
10. RECOMMENDATIONS 29
11. REFERENCES 30
12. ANNEXES 32
Information sheet 32
Consent Form 32
Data collection format 33
Consent form (Amharic version) 34

List of tables and figures

List Tables

Table 1: Socio-demographic Characteristics of study participants; Bahir Dar, Ethiopia, 2026 19
Table 2: clinical characteristics/symptoms of study participants; Bahir Dar, Ethiopia, 2026 (n=140) 21
Table 3: Ultrasound Findings Among Study Participants, Bahir Dar, Ethiopia, 2026 (n = 140) 22
Table 4: Bivariate and multivariable Logistic Regression Analysis of Factors Associated with abnormal pelvic ultrasound findings 23

List of figure

Figure 1. Conceptual frame work 11

Abstract

Introduction: Pelvic pain is one of the most common gynecologic complaints among reproductive-age women and accounts for a significant proportion of outpatient and emergency visits. Pelvic ultrasonography is the first-line imaging modality due to its safety, accessibility, and diagnostic value in identifying gynecologic and related pelvic pathologies. However, limited local evidence exists regarding the proportion of abnormal ultrasound findings and associated factors among reproductive-age women presenting with pelvic pain at Tibebe Ghion Comprehensive Specialized Hospital (TGCSH), Bahir Dar, Ethiopia.

Objectives: To determine the proportion of abnormal pelvic ultrasound findings and identify associated factors among reproductive age women presenting with pelvic pain at Tibebe Ghion comprehensive specialized Hospital, Bahirdar, Northwest Ethiopia, 2026

Methods: A hospital-based cross-sectional study was conducted in the Radiology Department of TGCSH from January 1 to January 31 2026. A total of 140 reproductive-age women (15–49 years) presenting with pelvic pain and referred for pelvic ultrasound were included using a consecutive sampling technique. Data were collected using a standardized format and analyzed using SPSS software. Descriptive statistics were used to summarize sociodemographic and clinical characteristics. Bivariate and multivariable logistic regression analyses were performed to identify factors associated with abnormal ultrasound findings. Statistical significance was declared at $p < 0.05$.

Results: The proportion of abnormal pelvic ultrasound findings was 52.1% (95%CI, 0.495-2.004). The most common abnormalities included ovarian cysts and uterine fibroids. In multivariable analysis, presence of associated symptoms (AOR = 2.21; 95% CI: 1.04–4.70; p = 0.039) and urban residence (AOR = 2.26; 95% CI: 1.02–4.99; p = 0.044) were significantly associated with abnormal findings.

Conclusion: More than half of reproductive-age women presenting with pelvic pain had abnormal pelvic ultrasound findings. Presence of associated symptoms and urban residence were significant predictors. These findings highlight the importance of pelvic ultrasound in the evaluation of pelvic pain and underscore the need to improve access to diagnostic imaging services, particularly for rural populations.

Keywords: Pelvic pain, Ultrasound, Reproductive-age women, Abnormal findings, Ethiopia

1. INTRODUCTION

1.2 Background

Pelvic pain is a pain located below the navel or belly button (umbilicus) and down to the hips. A feeling of pain or discomfort in the pelvis in a female patient may be part of a normal physiologic mechanism, may be associated with a medical crisis for which emergency therapy is needed to save the patient's life, may be associated with a chronic pelvic problem, or may remain forever and mysteriously unexplained(1). It may present acutely, chronically, or as a recurrent symptom, and can result from disorders of gynecologic, gastrointestinal, urinary, or musculoskeletal origin(2).

Acute pelvic pain (APP) is defined as a pelvic pain of less thanthree months' duration(3). In female patients, acute pelvic pain may be caused by gynecological, gastrointestinal, urinary tract and musculoskeletal pathologies(3-11). The most frequentgynecological causes of acute pelvic pain in non-pregnant women are pelvic inflammatorydisease, ruptured ovarian cysts, ovarian torsion, and degeneration or torsion of uterineleiomyomas(12). Acute pelvic pain is an extremely common symptom in female patients presenting to the emergency department (ED), urgent care centers and outpatient radiologic centers(12, 13). The selection of imaging in the evaluation of acute pelvic pain is determined by the clinically suspected differential diagnosis after careful evaluation(14).

Chronic pelvic pain (CPP) is defined as noncyclic pain lasting longer than 6 months(15). The most common gynecologic causes ofchronic pelvic pain include adenomyosis, endometriosis, leiomyomas, adhesions, and pelvic congestionsyndrome(9, 15). Pelvic ultrasound is the primary imaging modality used to assess women presenting with pelvic pain due to its accessibility, affordability, non-invasiveness, and high diagnostic yield. Ultrasound can reliably detect a wide spectrum of pathologies such as ovarian cysts, fibroids, adnexal masses, pelvic inflammatory disease (PID), free pelvic fluid, and early pregnancy complications(9).

In addition to clinical history and physical examination, Pelvic US is the ideal investigative tool to adopt as first line examination for women presenting with pelvic pain as is radiation free, has lower cost and allows for an accuratediagnosis of ovarian torsion, hemorrhagic ovarian cyst, endometriosis, pelvic inflammatorydisease, complications related to leiomyomas, and vascular anomalies first by placing themin the differential diagnosis and between other non-gynecological causes of pelvic painsuch as gastrointestinal and genitourinary disorders, the recognition of which canmake timely diagnosis possible and avoid further imaging tests(5).

Although ultrasound (US), computed tomography (CT), and magnetic resonance imaging (MRI) arestrongly integrated, the choice of which is the ideal diagnostic tool should be guided bothby clinical suspicion (gynecological vs non-gynecological cause) and by the risk–benefitratio (ionizing radiation and instrumental costs), too(16). Pelvic US is generally the firstdiagnostic tool used in this clinical setting and may require a transabdominal (TSA–US)and, if possible, transvaginal (TSV–US) approach to improve diagnostic sensitivity. CT andMRI may offer an added diagnostic value in pelvic pain assessment when US findings areunreliable or when pre-surgical evaluation is required(12, 17, 18).

1.2 Statement of The Problem

Pelvic pain continues to be a major global, regional, and local health challenge, with significant implications for women's reproductive health, healthcare utilization, and overall quality of life(19). Despite being one of the most frequent reasons for gynecologic and emergency department visits worldwide, its evaluation remains complex due to the wide range of potential etiologies, including gynecologic, obstetric, urinary, and gastrointestinal causes. Pelvic pain is a frequent and distressing complaint among women of reproductive age and has a considerable impact on women's health, emotional well-being, and quality of life. Chronic or recurrent pelvic pain can result in anxiety, depression, sexual dysfunction, and reduced productivity(19, 20). The pain may originate from gynecologic, gastrointestinal, urinary, or musculoskeletal causes(6, 7, 13).

On a global scale, pelvic pain affects a large number of women annually. It is estimated that one in five women experiences pelvic pain during their reproductive years, and chronic pelvic pain alone accounts for a major proportion of outpatient consultations and long-term disability(18). Many women live with undiagnosed or untreated causes of pelvic pain, leading to repeated hospital visits, psychosocial stress, infertility, and loss of productivity(20).

The overlapping clinical manifestations often make the underlying diagnosis uncertain and poses a significant diagnostic and management challenge in both outpatient and emergency settingslead to delayed diagnosis, misdiagnosis, or unnecessary interventions(15). Diagnostic imaging can be invaluable in this situation. Ultrasound remains the cornerstone of diagnostic evaluation for pelvic pain worldwide due to its affordability, safety, accessibility, and diagnostic accuracy(18, 21, 22). Across different settings, the proportion of abnormal pelvic ultrasound findings varies considerably, with higher diagnostic yields reported in emergency settings(18).

Global patterns show that the prevalence and types of pelvic pathologies are influenced by socioeconomic status, access to reproductive health services, prevalence of sexually transmitted infections, and cultural barriers that delay care-seeking.However, the factors associated with these abnormalities are not well understood(18). Certain pathologies, such as ovarian cysts and uterine fibroids (myomas), are strongly age-dependent, with ovarian cysts being more common in younger women and myomas more prevalent in older reproductive-age women. In contrast,

young women may often have normal pelvic ultrasounds despite presenting with pain. Other potential determinants—such as parity, menstrual history, history of pelvic inflammatory disease, prior pelvic surgery, and socioeconomic or behavioral factors—may also influence both the occurrence of pelvic pain and the likelihood of detecting pathology on imaging(20).

In resource-limited countries like Ethiopia, pelvic pain in women may also places a substantial economic burden on the healthcare system due to repeated OPD visits, unnecessary or prolonged inpatient admissions, and repeated empirical treatments if accurate diagnosis is made. The diagnostic challenge is also intensified by the limited availability and high cost of advanced imaging modalities like CT and MRI(23). Clinicians must often rely on clinical evaluation and basic investigations, which may not adequately distinguish among the many possible causes of pelvic pain. Consequently, ultrasound

has become the most accessible, cost-effective and radiation free imaging tool for evaluating reproductive women presenting with pelvic pain(14).

In Ethiopia, studies have shown a high prevalence of primary dysmenorrhea among women of reproductive age, where it is a major cause of pelvic pain, morbidity, and school absenteeism in high school and university students(24-26). However, these studies are largely symptom-based and do not incorporate imaging evaluation. To date, there are no studies that assess pelvic pain in relation to ultrasound findings or describe the proportion and pattern of abnormal pelvic ultrasound findings among reproductive-age women in Ethiopia. This lack of imaging-based evidence limits differentiation between functional causes of pelvic pain, such as primary dysmenorrhea, and underlying structural pathologies. Most of the clinical and radiologic datas being used for diagnostic purposes are foreign articles and researches with different demographic and disease characteristics. This scarcity of local evidence limits understanding of the prevailing causes of pelvic pain in Ethiopian women and hinders development of standardized diagnostic and clinical protocols suitable for local needs.

At TGCSH, a referral and teaching hospital, a large number of reproductive-age women present with pelvic pain visits Gynecologic OPD, emergency OPD and routinely undergo transabdominal pelvic ultrasound as part of their diagnostic evaluation. However, there is no systematically documented data on the proportion of abnormal ultrasound findings, the distribution of pelvic pathologies, or the clinical and demographic factors associated with these findings in this institution. This absence of local evidence limits accurate understanding of common causes of pelvic pain, hinders evidence based clinical and diagnostic decision-making, and restricts the development of standardized diagnostic protocols. This gap also restricts the ability of clinicians and radiologists to identify prevalent causes of pelvic pain, recognize local disease patterns, and develop standardized diagnostic approaches tailored to the hospital’s patient population. So, there is a need to asses proportion of abnormal ultrasound findings and associated factors among reproductive age women presenting with pelvic pain so that clinicians and radiologists in TGSH to relay on local epidemiologic data which is useful for appropriate diagnosis of these patients.

1.3 Significance of the study

This study will generate comprehensive local evidence on the spectrum and proportion of abnormal ultrasound findings and associated factors among reproductive-age women presenting with pelvic pain in TGCSH.

This study provides local epidemiologic data on the common causes of pelvic pain which are diagnosed by ultrasound, helping clinicians and radiologists to make faster and more accurate diagnoses.

By establishing the first baseline data in a local context, the study will contribute to the existing body of knowledge and serve as a foundation for future radiologic, gynecologic, and public health research in TGCSH and in Ethiopia.

Furthermore, the research will help policymakers and healthcare administrators in planning and allocating resources, developing or refining diagnostic and management protocols. Overall, the study is expected to enhance early diagnosis, guide targeted management, improve patient outcomes, and increase awareness among women about pelvic pain and the importance of seeking timely medical care.

2. LITERATURE REVIEW

2.1 Pelvic Pain in Reproductive-Age Women: Clinical Burden and Diagnostic Complexity**:** Pelvic pain in reproductive-age women is a frequent clinical presentation and a major diagnostic challenge due to its nonspecific symptoms and wide differential diagnosis. The overlap between gynecologic and nongynecologic causes often leads to delayed diagnosis and inappropriate management. Evidence indicates that many women experience prolonged symptom duration before definitive diagnosis, largely because clinical features overlap across conditions. Comprehensive evaluation—including pain characteristics, menstrual and gynecologic history, sexual and social factors, and detailed pelvic examination—is essential to guide further investigations such as imaging (15).

Gynecological morbidity represents a substantial contributor to pelvic pain globally, with a disproportionately higher burden in developing regions. A pooled analysis estimated the prevalence of overall gynecological morbidity at approximately 22%, although this is likely an underestimation due to underreporting associated with sociocultural stigma, lack of awareness, and limited access to healthcare services(19). Acute pelvic pain in women encompasses a broad etiologic spectrum, including both gynecologic and non-gynecologic causes. Gynecologic etiologies such as pelvic inflammatory disease (PID), hemorrhagic ovarian cysts, ectopic pregnancy, and ovarian torsion are commonly encountered, while degenerating fibroids and postpartum complications occur less frequently. Nongynecological causes, including acute appendicitis and ureteric stones, may present with similar clinical features and must be considered in the differential diagnosis(22).

Chronic pelvic pain has often multiple causative factors. Careful analysis of clinical history and detailed clinical examination must be carried out to guide further imaging investigations. Endometriosis is a common cause of chronic pelvic pain, although there is no correlation between the severity of lesions and pain intensity. Pelvic ultrasonography should be the first line imaging examination to search for causative conditions that include endometriosis, adenomyosis, pelvic varices and chronic infection(12).

2.2 Ultrasoundfindingsand etiologies in pelvic Pain: evidence from diverse settings:

Ultrasonography has consistently demonstrated high diagnostic yield in women presenting with acute pelvic pain. In a Yemeni study of 94 female patients aged 13–45 years, ultrasound identified a definitive cause in 80.85%, while 19.15% had normal findings. The majority of positive cases occurred in women of reproductive age (81.58%), compared to adolescents (18.42%). Ovarian cysts and their complications were the most common findings (29.79%), followed by PID (17.02%), acute appendicitis (9.57%), nephrolithiasis and ureteric stones (7.45%), ectopic pregnancy (5.32%), and uterine myoma necrosis (4.25%)(10). Similarly, a prospective study from India involving 48 patients reported ovarian cysts as the most frequent cause of acute pelvic pain, with hemorrhagic cysts accounting for 20.8%**,** corpus luteal cysts 14.58%**,** and endometriomas 12.5%**.**Nongynecological causes such as cystitis, appendicitis, and ureteric calculi each accounted for 10.41%of cases, while ovarian torsion **(**8.33%**)** and PID **(**4.10%**)** were less common. In 8.33% of cases, no definitive diagnosis was established, underscoring that a proportion of patients may have normal imaging findings despite significant symptoms(11).

A study at Dartmouth Medical School, Dartmouth–Hitchcock Medical Center, Lebanon, evaluated 72 female patients with pelvic pain and normal pelvic ultrasound findings. Among patients with acute **(**19**)** and subacute (53**)** pain, 62 (86%) experienced symptom improvement or resolution, while in those with chronic pain **(**14 patients, ≥6 months**),** only 7 (50%) improved. Further imaging **(**13 studies in 9 patients**)** revealed normal findings in 12 studies, with one CT scan detecting diverticulitis. Surgical interventions **(**19 procedures in 11 patients**)** identified clinically significant disease in only 4 cases (endometriosis with pelvic varices, endometriosis, adenomyosis, or pelvic adhesions). The study concluded that most women with pelvic pain and normal ultrasound findings improve, particularly in acute or subacute cases, and that the yield of further imaging and surgical procedures is low(27).

Findings from Pakistan further support the diagnostic value of ultrasound in pelvic pain. In a study of 97 non-pregnant women**,** the most common ultrasound findings included uterine fibroids **(**26.8%**),** ovarian cysts **(**16.4%**),** polycystic ovaries **(**9.3%**),** endometriotic cysts **(**6.2%**)**, PID **(**5.2%**),** and appendicitis **(**4.1%**).** The study concluded that pelvic pain occurs most frequently during reproductive age and that uterine fibroids and ovarian cysts are leading causes(14).

2.7 Determinants of abnormal ultrasound findings: Several studies have explored factors influencing ultrasound findings in women with pelvic pain.A large retrospective Nigerian study involving 1,599 women presenting with pelvic pain demonstrated that 52.6% were aged 15–49 years. Transabdominal ultrasound was the most commonly used technique, and the predominant findings were uterine fibroids, PID, and ovarian cysts. Importantly, the study reported low clinical diagnostic accuracy prior to imaging **(**26.14%**),** highlighting the reliance on ultrasound for definitive diagnosis(28). A study in Owerri, South Eastern Nigeria, evaluated 250consecutive women referred for pelvic ultrasound, using abdominal and transvaginal approaches. The majority of patients were nulliparous (148, 59.2%**)** and aged 30–39 years **(**108, 43.2%**).** Most referrals came from doctors **(**164, 64%**),** while 74 (29.6%) were self-referred. The most common indication for ultrasound was "to check the womb" **(**89, 35.6%**),** with pelvic pain accounting for 7.6% of referrals. Post-ultrasound, 44.4% had a normal uterus, and the most frequent abnormalities were fibromyoma **(**16.4%**)** and vaginal bleeding-related findings **(**12%**).** Overall, 36.4% of patients had detectable abnormalities. The study concluded that pelvic ultrasound is valuable and should be encouraged, even when referrals do not originate from clinicians, due to the significant number of abnormalities identified (29).

An analytical cross-sectional study from southeastern Nigeria involving 300 women aged 20–49 years found tubo-ovarian abscess to be the most prevalent gynecologic emergency (22.33%), with the highest occurrence in the 20–24-year age group (26.9%(30).Studies in Ethiopia have reported a high prevalence of gynecologic morbidities, conditions that are among the leading causes of pelvic(23, 31).

A hospital-based study from Nepalreported similar trends, where ovarian cysts were the most frequent cause of acute pelvic pain**,** with 20.8% hemorrhagic cysts**,**14.58% corpus luteal cysts**,** and 12.5% endometriomas. Non-gynecologic causes, such as cystitis, acute appendicitis, and ureteric calculi, were each observed in 10.41% of cases, while ovarian torsion and pelvic inflammatory disease were found in 8.33% and 4.10%**,** respectively. Notably, 8.33% of participants had no ultrasound-detectable pathology**.**

2.8 Gaps in the literatures:Despite the high prevalence of gynecologic morbidity as a cause of pelvic pain among reproductive-age women, there is limited evidence from Ethiopia, and particularly from TGCSH, regarding abnormal ultrasound findings in this population. Most existing studies have been conducted in other countries such as Yemen, Nigeria, Pakistan, and Lebanon, which limits the applicability of their findings to the local context. Furthermore, while previous research has identified common causes of pelvic pain such as ovarian cysts, fibroids, and pelvic inflammatory disease, the factors associated with these abnormal ultrasound findings—including age, parity, menstrual history, and prior gynecologic conditions—have not been well characterized. Hospital-based studies in Ethiopia assessing reproductive-age women presenting with pelvic pain for ultrasound are also scarce. These gaps underscore the need for a comprehensive study at TGCSH to determine the proportion of abnormal ultrasound findings and associated factors, providing valuable baseline data for clinicians, researchers, and policymakers.

3. CONCEPTUAL FRAMEWORK

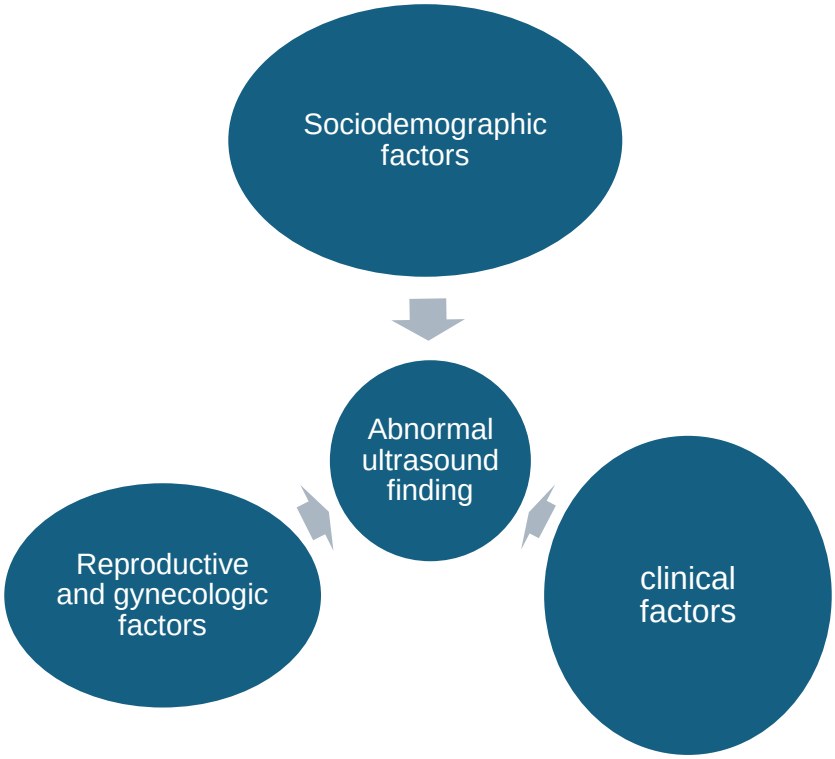

Figure 1. Conceptual frame work(11, 16)

4. OBJECTIVES

4.1 General objectives

To determine the proportion of abnormal pelvic ultrasound findingand associated factors among reproductive age women presenting with pelvic pain at TGCSH.

4.2 Specific objectives

1. To determine the proportion of reproductive-age women with pelvic pain who have abnormal pelvic ultrasound findings in TGCSH
2. To identify and categorize the common ultrasound-diagnosed causes of pelvic pain among reproductive-age women at the TGCSH.
3. To identify factorsassociated with abnormal pelvic ultrasounds in reproductive age women presenting with pelvic pain in TGCSH.

5. METHODS AND MATERIALS

5.1 Study Design

- Aprospective cross-sectional (observational) study design was used. All eligible reproductive-age women presenting with pelvic pain during the study period and sent for pelvic ultrasound were consecutively recruited until the required sample size is achieved.

5.2. Study area and period

The study was conducted atTibebe-Ghion comprehensive specialized hospital (TGCSH) from January 1 to January 31 G.C. TGCSH is found 10 km away from Bahir Dar and 491 km from Addis Ababa on the way to Adet. The hospital gives service for about 5 million people. It also serves as teaching hospital for Bahir Dar university, college of medicine and health science. It has different units within it including Internal Medicine, surgery, gynecology and obstetrics, pediatrics, ophthalmology, radiology, dermoto-venorology, ENT, Oncology, Psychiatry, and Dentistry.The radiology department in TGCSH is one of thedepartments in the institution providing advanced diagnostic imaging services (including X-ray, ultrasound, CT, and MRI) and academic services.Currently there are 9 consultant radiologists, 28 training radiology residents, 7 radiology technologist and 8 nurses in the department.

5.3 Population

5.3.1 Source Population

All reproductive-age women (15–49 years) presenting with pelvic pain at Tibebe Ghion Specialized Hospital.

5.3.2 Study Population

Reproductive-age women (15–49 years) presenting with pelvic pain who were sent for pelvic ultrasound during the study period and fulfill the inclusion criteria.

5.4 Inclusion and Exclusion Criteria

Inclusion criteria:

- All Women of reproductive age (15–49 years) presenting with pelvic pain, come for ultrasound examination to radiology department and provide consent.

Exclusion criteria

- Pregnant women
- Women with previously confirmed pelvic malignancy or surgery.
- Patients refusing participation in the research

5.5 Sample size estimation

The sample size for this study was calculated using a single population proportion formula, considering the primary outcome as the proportion of abnormal ultrasound findings among reproductive-age women presenting with pelvic pain. The expected prevalence of abnormal ultrasound findings was taken as 80.85%**,** based on a similar study conducted in Yemen (10). A confidence level of 95% (Z = 1.96) and a margin of error of 5% (d = 0.05**)** were used.

$$n = \frac{Z^2 * p* (1-p)}{d^2}$$

- Where n is the required sample size, Z is the desired confidence level (for 95% Z is 1.96), p is the prevalence of abnormal ultrasound finding, and d is margin of error (0.05)
- So, $n= \frac{1.96^2 *0.8085*(1-0.8085)}{(0.05)^2} = 238$

Since the total population of reproductive-age women presenting with pelvic pain for ultrasound at TGCSH during the study period is relatively small, a finite population correction was applied.

$$nf = \frac{ni}{1+ni/N} = \frac{238}{1+238/160} = 96$$

Where, N is the estimated total population of eligible women during the study period.

Based on hospital registration data, the average number of eligible women per month is 160. To ensure adequate representation and maximize study precision, all eligible women during the study period were approached. Of the estimated 160 women, 150 were eligible and consented to participate, while 10 were excluded due to non-response and ineligibility. Complete data were obtained from 140 participants, which makes the final study sample.

5.6. Sampling method

A consecutive sampling technique was used in this study. All reproductive-age women (15–49 years) who presented to the radiology department for pelvic ultrasound due to pelvic pain and

met the inclusion criteria were consecutively enrolled during the study period. Enrollment continued throughout the one-month study period until the end of data collection

5.7 Study Variables

5.7.1 Dependent variable

- Presence of abnormal ultrasound finding

5.7.2. Independent variables

- Age
- Presence of associated symptoms
- Duration of pain
- Type of pelvic pain
- Residence
- Occupation

5.8 Operational definition:

Abnormal pelvic ultrasound finding: Any pelvic abnormality detected on ultrasound

Uterine fibroid (Myoma): well-defined hypoechoic myometrial mass(17).

Ovarian cyst: Well-defined anechoic lesion located in either the left or right ovary; it could be simple or complex(32).

Endometrioma: Cystic ovarian lesion with low-level internal echoes (17, 18).

Pelvic fluid**:** Fluid within the pelvic cavity (pouch of Douglas, cul-de-sac)(32).

Hydrosalpinx**:**Dilated, fluid-filled fallopian tube with or without internal septations seen on ultrasound(18).

Adnexal mass:Any solid, cystic, or complex mass located at the right or left adnexa adjacent to the uterus(32).

5.9 Data Collection methods

5.9.1 Data Collection Procedure

5.9.1.1 Clinical Data

A structured and pre-tested data collection form was prepared to ensure consistency and accuracy of the data gathered. The form was used to collect sociodemographic informationfrom reproductive-age women presenting with pelvic pain for ultrasound evaluation. Clinical history, such as the duration and nature of the pain and any associated symptoms were obtained from both the ultrasound request forms and directly from the patients.

5.9.1.2 Ultrasound Examination

A real-time ultrasound scanner with a 3.5–5 MHz curvilinearand 7-10 MHZ linear transducer were used to perform transabdominal pelvic ultrasounds on all participants with a full urinary bladder. Findings were documented, including uterine characteristics (size, contour, myometrium, masses), endometrial features (thickness, echogenicity, focal lesions), ovarian findings (size, follicles, cysts, masses, torsion), and adnexal or peritoneal abnormalities (free fluid, tubo-ovarian masses, PID).Additional ultrasound findings such as appendicitis, ureteric stones and hydronephrosis were recorded. All examinations were supervised to ensure standardized and consistent imaging.

5.10 Data analysis and processing methods

The collected data was entered into a secure, password-protected Statistical Package for the Social Sciences (SPSS)version 27 database. Before the analysis, the dataset was thoroughly cleaned to identify and correct any errors or inconsistencies, including duplicate entries and incomplete records. Descriptive statistics was used to summarize the sociodemographic characteristics and pelvic ultrasound findings of the study participants. Bivariate logistic regression analysis was performed to assess the association between each independent variable and the outcome variable (abnormal ultrasound finding). Variables with a p-value of less than 0.25 in the bivariate analysis were considered candidates for multivariable logistic regression. Multivariate logistic regression was performed to identify independent predictors of abnormal pelvic ultrasound findings. Prior to fitting the multivariable model, multicollinearity among independent variables was assessed**,** and variables demonstrating significant collinearity were not entered simultaneously into the final model; instead, the most clinically relevant variable was retained. Adjusted odds ratios (AOR) with 95% confidence intervals (CI**)** were calculated to determine independent predictors. Statistical significance was declared at a p-value of less than 0.05. The results of the analysis was presented using tables to ensure clarity and ease of interpretation.

5.11 Data quality assurance

To ensure data quality, orientation was provided to the data collectors (residents) who performed the ultrasound examinations prior to the start of data collection, ensuring standardized procedures and uniform data acquisition. A pre-test of the questionnaire was conducted to assess its clarity, consistency, and appropriateness, and necessary adjustments will be made based on the findings. During the data collection period, the principal investigatorperformed a daily review of the collected data to ensure completeness, accuracy, and adherence to the study protocol.

5.12ethical consideration

Ethical approval was obtained from IRB (institutional review board) of BDU CMHS, TGCSH.In addition, informed consent was obtained from all patients who participate in the study after providing them with clear information regarding the objectives, procedures, potential risks, and benefits of the research.Patient’s confidentiality was kept at each step of the study since their

name and other identification was not documented. All participants don't want to provide information were able to decline consent.

6. RESULTS

6.1. Socio-demographic characteristics

A total of 140 participants were included in the study with a response rate of 93.3%. The majority of the participants (74, 52.9%) were between 21–30 years of age, mean age of 28 yrs and SD of 7.17. The largest proportion of participants were merchants by occupation. Most participants had completed primary education (61, 43.6%). The majority were urban residents (92, 65.7%). Most of the participants were married (92, 65.7%). Most of the participants were Orthodox Christians (67, 47.9%).

Table 1: Socio-demographic Characteristics of study participants; Bahir Dar, Ethiopia, 2026

Variable name	Category	Frequency	Percentage
Age	Less than 20 yrs.	21	15
	21-30 yrs.	74	52.9
	31-40 yrs.	35	25.0
	Greater than 40 yrs	10	7.1
	Total	140	100
Occupation	Gov't employee	24	17.1
	Merchant	46	32.9
	Housewife	42	30.0
	Student	28	20.0
Educational status	No formal education	25	17.9
	Primary school	61	43.6
	College and above	54	38.6
Residency	Urban	92	65.7
	Rural	48	34.3
Marital status	Single	42	28.6
	Married	92	65.7
	Divorced	5	3.6
	Widowed	3	2.1
Religion	Orthodox	67	47.9

	Muslim	42	30.0
	Protestant	19	13.6
	Catholic	12	8.6
Parity	Nulliparous	63	45.0
	Para 1 and above	77	55

6.2. clinical characteristics among study participants

More than half of the participants (75, 53.6%) experienced pain lasting from 1 day to 1 week, while 36 (25.7%) reported pain for more than 6 months. Sixteen (11.4%) had pain for 1 week to 6 months, and 13 (9.3%) reported pain lasting less than 24 hours. Most participants presented with acute pain (103, 73.6%), whereas 37 (26.4%) had chronic pain. Additionally, 93 (66.4%) reported the presence of other associated symptoms like menstrual irregularity, abnormal vaginal discharge, nausea/vomitingand dyspareunia while 47 (33.6%) did not.

Table 2: clinical characteristics/symptoms of study participants; Bahir Dar, Ethiopia, 2026 (n=140)

Variable name	Category	Frequency	Percentage
Duration of pain	Less than 24 hrs	13	9.3
	1 day to 1 week	75	53.6
	1 week to 6 months	16	11.4
	More than 6 months	36	25.7
Type of pain	Acute pain	103	73.6
	Chronic pain	37	26.4
Presence of other associated symptoms	Yes	93	66.4
	No	47	33.6
	Total	140	100

6.3. proportion of abnormal pelvic ultrasound findings

The proportion of abnormal pelvic ultrasound findings was 52.1% with a 95% CI of 0.496-2.004. Of the abnormal cases, 60 (42.9%) were gynecologic in origin and 13 (9.3%) were non-gynecologic. The most common gynecologic finding was simple ovarian cyst (11.4%), followed by uterine myoma (8.6%). Appendicitis (3.6%) was the most frequent non-gynecologic finding.

Table 3: Ultrasound Findings Among Study Participants, Bahir Dar, Ethiopia, 2026 (n = 140)

Ultrasound finding	Frequency	Percentage
Normal	67	47.9
Abnormal (total)	73	52.1
Gynecologic		
Uterine myoma	12	8.6
Simple ovarian cyst	16	11.4
Hemorrhagic ovarian cyst	8	5.7
Culdesac collection	6	4.3
Endometrioma	3	2.1
Cervical cancer	5	3.6
TOA	2	1.4
Hydrosalpinx	3	2.1
Endometrial polyp	2	1.4
Solid adnexal mass	3	2.1
Subtotal gynecologic	60	42.9
Non-gynecologic		
Appendicitis	5	3.6
Hydronephrosis	1	0.7
Cystitis	4	2.9
Ureteric stone	2	1.4
Urinary bladder stone	1	0.7
Subtotal non-gynecologic	13	9.3
Total	140	100

6.4 Factors Associated with abnormal pelvic ultrasound finding

On bivariate logistic regression analysis, presence of other associated symptoms (COR = 2.6871; 95% CI: 1.293–5.518; p = 0.008), type of pain (COR = 3.346; 95% CI: 1.469–7.619; p = 0.004) and rural residence (COR = 2.860; 95% CI: 1.369–5.973; p = 0.005)were significantly associated with the abnormal pelvic ultrasound findings at $p < 0.05$. Age group, marital status parity and menstrual irregularity were not significantly associated ($p > 0.05$) with abnormal pelvic ultrasound findings.

On multivariable logistic regression analysis only the presence of associated symptoms (AOR = 2.239; 95% CI: 1.054–4.753; p = 0.036) was statistically significantly associated with abnormal pelvic ultrasound findings. Rural residence (AOR = 2.174; 95% CI: 0.991–4.768; p = 0.053).and type of pelvic pain (AOR = 2.365, CI 0.984-5.681, p =0.054) were not statistically significantly associated with abnormal pelvic ultrasound findings on multivariable logistic regression.

Table 4: Bivariate and multivariable Logistic Regression Analysis of Factors Associated with abnormal pelvic ultrasound findings

Variable	Category	Abnormal pelvic ultrasound findings		COR with 95% CI	AOR with 95%CI		P value
		Yes	No				
Associated symptoms	Yes	56	37	2.671(1.293-5.518)	2.239	1.054-4.753	0.036
	No	17	30	1	1		
Type of pain	chronic	27	10	3.346 (1.469-7.619)	2.365	0.984-5.681	0.054
	Acute	46	57	1		1	
Menstrual irregularity	Yes	25	23	0.996(0.495-2.004)			0.992
	No	48	44	1			
Residence	Rural	33	15	2.860	2.174	0.991-	0.053

				(1.369-5.974)		4.768	
	Urban	40	52	1	1		
Parity	Parous	40	37	0.983 (0.505-1.914)			0.959
	Nulliparous	33	30				
Marital status	single	21	19	1.020, (0.490-2.126)			0.957
	married	52	48	1			
Age	Above 40	6	4				
	31-40	19	16	0.792, (0.190-3.306)			0.749
	21-30	39	35	0.743(0.194-2.851)			0.665
	15-20	9	12	0.500, (0.108-2.314)			0.375

7. DISCUSSION

This study evaluated the proportion, pattern, and determinants of abnormal pelvic ultrasound findings among women presenting with pelvic pain at Bahir Dar, Ethiopia. Among 140 participants, 52.1% had abnormal findings, with gynecologic causes predominating (42.9%) and non-gynecologic causes accounting for 9.3%.

7.1 Proportion of Abnormal Pelvic Ultrasound Findings

In this study, 52.1% of participants had abnormal pelvic ultrasound findings, while 47.9% had normal studies. Gynecologic causes accounted for the majority of abnormalities, emphasizing that pelvic pain in women of reproductive age is most commonly related to gynecologic pathology. This prevalence is consistent with studies from Nigeria and Pakistan, which reported 44–53% abnormal ultrasound findings among women with pelvic pain(14, 29).This proportion (51%) is lower than that reported in a study from Yemen 80% (60% was gnecologic, 20.21% non-gynecologic and 19.15 non-detectable) , which may be due to differences in the study population, referral pattern(10). The proportion of normal findings (47.9%) highlights that a substantial number of women may present with pelvic pain despite the absence of detectable pathology on ultrasound, consistent with Lebanon's study, where most women with normal pelvic ultrasound improved spontaneously(10). Normal pelvic ultrasound findings in reproductive-age women with pelvic pain may reflect functional causes, such as primary dysmenorrhea, musculoskeletal pain, or early-stage endometriosis, which are not detectable on ultrasound(2, 24-26).

7.2 Distribution of abnormal pelvic ultrasound findings

Among abnormal findings, simple ovarian cysts (11.4%) and uterine myoma (8.6%) were most common. Other gynecologic findings included hemorrhagic ovarian cysts (5.7%), cul-de-sac collections (4.3%), cervical cancer (3.6%), hydrosalpinx, endometrioma, endometrial polyps, and tubo-ovarian abscess. These results mirror patterns observed in Pakistanand Nigeria, where ovarian cysts and fibroids are the predominant causes of pelvic pain(10, 29). Appendicitis (3.6%) was the leading non-gynecologic abnormality, followed by cystitis, ureteric stones, urinary bladder stones, and hydronephrosis. Although less common, these findings are clinically significant, reinforcing that pelvic pain in women may originate from both gynecologic and non-

gynecologic sources, consistent with other studies(10).Comparatively,hospital-based study in Nepal also reported ovarian cysts as the leading pathology, including hemorrhagic cysts (20.8%), corpus luteal cysts (14.6%), and endometriomas (12.5%), while non-gynecologic causes such as cystitis, acute appendicitis, and ureteric stones each accounted for 10.4% of cases (33).

7.3 Factors associated with abnormal ultrasound findings

Presence of associated symptoms was the only statistically significant predictor for the presence of abnormal pelvic ultrasound finding. Women with symptoms such as abnormal bleeding, dysmenorrhea, or discharge were 2.239 times more likely to have abnormal ultrasound findings (AOR = 2.239; 95% CI: 1.054–4.753; p = 0.036).Type of pelvic pain showed a borderline association for the presence of abnormal pelvic ultrasound. Chronic pain was associated with higher odds of abnormal findings compared to acute pain (AOR = 2.365; 95% CI: 0.984–5.681; p = 0.054). This suggests that structural abnormalities like fibroids or ovarian cysts may be more common in chronic presentations, though the association did not reach statistical significance. Rural residents have slightly higher odds of abnormal ultrasound findings compared to urban residents (AOR = 2.174; 95% CI: 0.991–4.768; p = 0.053), which may reflect differences in healthcare access and delayed presentation of women from rular areas. Women from rural areas may have limited access to healthcare, transportation barriers, or low awareness of gynecologic symptoms, and present later resulting in more detectable pathology. This aligns with studies in Nigeriawhere rural women frequently present with more advanced gynecologic disease(29).Other socio-demographic factors, including age, marital status, occupation, and parity, were not independently associated with abnormal ultrasound findings. This suggests that clinical presentation and symptoms are stronger predictors of pathology than demographic characteristics. Similar observations have been reported in other studies(27).Women presenting with pelvic pain and having other associated symptoms (like dysuria, fever, nausea, vomiting) have more positive ultrasound findings.

8. STRENGTH AND LIMITATION OF THE STUDY

The study has several strengths, including a reasonably adequate sample size of 140 participants, a high response rate (93.3%), and comprehensive assessment of socio-demographic and clinical characteristics alongside systematic pelvic ultrasound evaluation, allowing reliable detection of both gynecologic and non-gynecologic abnormalities. Additionally, the study provides important context-specific evidence from Ethiopia, where data on ultrasound findings among women with pelvic pain are limited. The sample size, while sufficient for descriptive and bivariate analysis, may have limited statistical power for detecting weaker associations in multivariable analysis, particularly for less common abnormalities. Being a hospital-based, single-center study may limit generalizability and introduce selection bias, and participants may have been referred for more severe or persistent symptoms, potentially overestimating the prevalence of abnormalities. Ultrasound is operator-dependent, and some subtle pelvic abnormalities of reproductive age women may be missed due to lack of advanced imaging correlation.

9. CONCLUSION

In this study, more than half of women presenting with pelvic pain had abnormal ultrasound findings, predominantly gynecologic in origin, with simple ovarian cysts and uterine myoma being the most common. Associated symptoms (like menstrual irregularity, abnormal vaginal discharge, dysuria, dysmenorrhea nausea and vomiting) was a significant predictor of abnormal pelvic ultrasound findings among reproductive-age women presenting with pelvic pain at TGCSH, Bahir Dar.Chronic pain and rural residence have higher odds of abnormal pelvic ultrasound findings. but were not independently statistically significant. Ultrasound remains a valuable diagnostic tool for women with pelvic pain, particularly those with additional clinical symptoms.

10. RECOMMENDATIONS

Prioritize pelvic ultrasound for women with pelvic pain who report associated symptoms (bleeding, discharge, or severe dysmenorrhea), as these patients have higher likelihood of abnormal findings.Consider careful evaluation of acute pain presentations, even if not statistically significant, as a potential indicator of pathology. Consider functional and early stages of pelvic pathologies that may not be detected by standard ultrasound in women. Further research is also recommended on associated factors of specific pelvic pathologies than causes pelvic pain in women.

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12. ANNEXES

Information sheet

Principal investigator: Alemu Tebebu Walle (MD, Radiology Resident)

Objective:To determineproportion of abnormal ultrasound findings and associated factors among reproductive age women presenting with pelvic pain in TGCSH

Benefit of the study: There will not be any direct payment for participating in this study. But findings from this study reveal important for health personnel and community at large.

Risk of the study: Participating in this study will not have any risk or harm.

Confidentiality: Any information forwarded will be kept confidential and names will not be written or specified, and all the data collection will be coded for anonymity. Only the principal investigator will know the details and he will discard it after completing analysis.

Contact details of principal investigator:

Name of principal investigator: Alemu Tebebu (MD, Radiology Resident)

Phone number: +251918973336

E-mail: dalemutibebu@gmail.com

Consent Form

Hello, I am a 3rd year radiology resident at Bahir dar university school of medicine and health sciences TGCSH. I am going to carry out a study on proportion of abnormal ultrasound findings and associated factors among reproductive women presenting with pelvic pain at TGCSH. I would like you to give genuine answer for the listed questions. I assure you that the information you put in this format will be handled strictly confidential and used only for study purpose.

Do you agree?

A. Yes B. No

If yes continue to the next page:

Data collection format/ / /……

Part I. Socio-Demographic Information

1. Patient ID (Code): _____
2. Age (years):
3. Residence: Urban / Rural
4. Religion: A. Orthodox, B. Muslim, C. protestant, D. Catholic E. other
5. Educational status: none/Primary/secondary/university and above
6. Marital Status: Single / Married / Divorced / Widowed
7. Occupation:Government employee/merchant/house wife/student

Part II: Clinical information

1. Type of Pelvic Pain: Acute / Chronic (>6 months)
2. Duration of Pain: <24 hours / 1–3 days / 4–7 days / >1 week and less than 6 months / >6 months
3. Associated Symptoms: Fever / Vaginal discharge / Vaginal bleeding / Nausea / Dysuria / Dyspareunia / Infertility history
4. Menstrual Regularity: Regular / Irregular
5. Parity: Nulliparous / Para 1–2 / Para ≥3
6. Contraceptive Use: None / OCP / Injectable / Implant / IUCD/emergency contraceptive pills
7. Clinical diagnosis (from the ultrasound request)

Part III Ultrasound detail

1. Type of Ultrasound done

A. Transabdominal B. Transvaginal

2. Operator

A. Year II B. Year III resident C. Consultant radiologist

3. Ultrasound findings:

3.1 Uterine size: normal / enlarged/ small

3.2 Uterine fibroids: Yes / No

3.3 Ovarian cyst Yes/ No, if yes simple or complex?

3.4 Solid Adnexal mass Yes / No

3.5 Free pelvic fluid: Yes/ No

3.7 Hydrosalpinx Yes / No

3.7 Appendicitis: Yes / No

3.8 Ureteric stone yes/no

3.9 Other:

Final impression by imaging:

4. Recommendation if any: A. Follow up B. CT C. MRI D. Biopsy

Consent form (Amharic version)

እኔአለሙእባላለሁ።በባህርዳርዩኒቨርሲቲየሕክምናእናየጤናሳይንስትምህርትቤትየሶስተኛአመትየሬድዮሎጂ የስፔሻሊቲተማሪነኝ።ከ 15 እስከ 49 እድሜባሉበታችኛውየሆድህመምበሚመጡእሴቶችላይበሚገኙ የ አልትራሳውንድውጤቶችላይእንዲሁምተያያዥነገሮችላይጥናትማካሄድእፈልጋለሁ።በመሆኑምእርስዎየጥናቱአካልእንዲሆ ኑፈቃዱወትንእጠይቃለሁ። ሁሉምየሚሰጡትመረጃሚስጥርየሚጠበቅመሆኑንላረጋግጥልወትእፈልጋለሁ።

ለጥያቄውፈቃደኛነዎት?

A. አዎ B. አይ

ክፍል I፡የማህበራዊእናየሕይወትመረጃ

1. የታካሚመታወቂያ (ኮድ): _____
2. ዕድሜ (ዓመት): _____
3. መኖሪያ: ከተማ / ገጠር
4. ሃይማኖት: _____
5. የጋብቻሁኔታ? ያገባ/ ያላገባ/ አግብቶየፈታ/ ባልየሞተበት
6. ሙያ: _____

ክፍል II፡የሕክምናመረጃ

1. የህመምአይነት። ከ 6 ወርበላይ / ከ 6 ወርበታች
2. የህመምጊዜ: <24 ሰዓት / 1–3 ቀናት / 4–7 ቀናት / >1 ሳምንት / >6 ወር
3. የተያያዙምልክቶች (ሁሉንምምረጡ):
    - ትኩሳት
    - የማህጸንፈሳሽ
    - የሴትደምመውጣት
    - መውለድአለመቻል
    - ማስታወክ
4. ስንትልጅወልደዋል? ምንም / 1-2 / ከ 2 በላይ
5. የወሊድመከላከያይጠቀማሉ? ከተጠቀሙየትኛውንአይነት? የሚዋጥ ፣ የሚወጋወይምመድፌ ፣ ክንድላይየሚቀበር