

## ORIGINAL ARTICLE

# Pattern and Distribution of Pelvic Pathologies Detected by Transvaginal Sonography and Laparoscopy among Subfertile Women in a Tertiary Care Hospital

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## ABSTRACT

**Background:** Subfertility affects 10-15% of couples, and pelvic diseases are key etiological factors in women. Transvaginal sonography (TVS) is used as first-line imaging, with laparoscopy remaining the gold standard for thorough pelvic examination. This study aimed to assess the pattern and distribution of pelvic diseases found by TVS and laparoscopy in subfertile women, as well as the diagnostic association between these modalities. **Methods & Materials:** This cross-sectional study was carried out at BIRDEM General Hospital in Dhaka from January 2023 to June 2024. 66 subfertile women had TVS on day 9 of their menstrual cycle, followed by diagnostic laparoscopy with chromopertubation in the post-menstrual phase. Data were entered and analyzed using SPSS version 26, with Fisher's exact test measuring correlation between findings ( $p < 0.05$ ). **Results:** The mean age was  $29.1 \pm 3.9$  years, the mean duration of subfertility was  $4.48 \pm 3.3$  years, and 69.7% had primary subfertility. 60.6% of individuals had irregular menstrual periods. The most prevalent conditions were PCOS (53.1% on TVS and 56.1% on laparoscopy), ovarian cysts (18.2% vs. 15.2%), and endometriosis (13.6% vs. 12.1%). Only laparoscopy revealed peritubal adhesions (4.5%) in laparoscopy only. Normal results were uncommon (3.1% on laparoscopy, 10.6% on TVS). For individual disorders, there were no statistically significant changes between modalities ( $p > 0.05$ ). TVS-detected diseases were substantially predicted by irregular menstrual cycles (adjusted OR=3.21,  $p=0.048$ ). **Conclusion:** Subfertile women have a high prevalence of pelvic disease, with the most common being polycystic ovarian syndrome, while peritubal adhesions were detected exclusively by laparoscopy. While TVS and laparoscopy have statistically similar results, laparoscopy is still required to detect peritoneal pathologies. A supplementary technique improves diagnostic accuracy in subfertility evaluation.

**Keywords:** Subfertility, Transvaginal sonography, Laparoscopy, Polycystic ovarian syndrome, Peritubal adhesions

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## INTRODUCTION

The problem of subfertility, described as the failure to conceive within 12 months of regular unprotected intercourse, has been observed to affect 15% of couples worldwide [1]. The problem of subfertility has been most evident among developing countries due to social taboos as well as a lack of facilities to diagnose the problem [2]. In Bangladesh, it has been found to range between 10-15%, with pelvic pathologies contributing greatly to subfertility among women [3]. Proper diagnosis is an important aspect towards managing such pathologies. Transvaginal sonography (TVS) has become an established primary imaging technique in the assessment of subfertile women because of its non-invasive nature and high spatial resolution and capability to evaluate uterine and adnexal pathology [4]. TVS can reliably identify patients with polycystic ovary syndrome (PCOS), ovarian cysts, uterine malformations, and certain tubal abnormalities [5]. The limitations of TVS are in identifying peritoneal causes such as endometriosis, peritubal adhesions, and tubal patency, which are common in the subfertile group [6]. Diagnostic laparoscopy is generally considered the gold standard in the investigation of pelvic

pathology in subfertility because it provides an opportunity for the direct visualization of pelvic organs and allows chromopertubation to assess tubal patency [7]. Indeed, various studies have revealed that the proportion of subfertile women in whom laparoscopy detects pathologies undetected by TVS ranges from 40 to 60%, especially adhesions and mild-to-moderate endometriosis [8]. There are also complications and financial costs due to this invasive nature. Laparoscopy offers unparalleled diagnostic and therapeutic opportunities, which are particularly useful when empirical treatment may not be applicable in resource-poor countries [9]. Polycystic ovarian syndrome remains the most common endocrine disorder affecting reproductive-aged women, with prevalence ranging from 8-13% globally and up to 25% among subfertile women [10]. Another major contributor to subfertility is endometriosis, which affects 25-50% of subfertile women and is often underdiagnosed by conventional imaging [11]. Tubal factor subfertility, primarily due to pelvic inflammatory disease and resulting adhesions, comprises approximately 30-35% of female subfertility cases in South Asian populations [12]. Despite advances in imaging technology, the degree of diagnostic

concordance between TVS and laparoscopy is highly variable depending on the pelvic pathology, and sensitivity was found to be between 30% and 90% according to conditions [13]. Few trials have been conducted in Bangladesh comparing these methods among subfertile women, and this leaves a gap in our understanding of their relative performance using these two methods in our region. To design cost-effective diagnostic algorithms, the pattern and distribution of pelvic pathologies, as well as the correlation between TVS and laparoscopy, must become an area of critical consideration for us in this region. This study was conducted to assess the pattern and distribution of pelvic pathologies among subfertile women using transvaginal sonography and laparoscopy, as well as the diagnostic correlation between TVS and laparoscopy.

**METHODS & MATERIALS**

The cross-sectional analytical study was carried out in the Department of Obstetrics and Gynecology, BIRDEM General Hospital, Dhaka, from January 2023 to June 2024. Study participants were subfertile women belonging to the 18-45-year age group, purposively sampled according to availability and pre-set inclusion criteria. Women who were 18-45 years old with either primary subfertility (inability to conceive after at least 12 months of regular, unprotected sexual intercourse without previous conception) or those with secondary subfertility (inability to conceive after at least 12 months, even in the presence of previous conception), and who were cohabiting for at least 12 months were considered for this study. Couples who were not cohabiting for at least 12 months before study inclusion, those with pre-existing male factor subfertility (abnormal Semen analysis as the definite underlying pathophysiological reason), as well as those with

absolute contraindications to the technique (Severe Cardiopulmonary disease, Un corrected Coagulopathy, Intestinal obstruction), and relative contraindications (Massive Obesity, Extensive abdominal adhesions, Large Pelvic masses) were excluded from the study. 66 patients were enrolled in this study. A semi-structured questionnaire was used to document sociodemographic, gynecological, and obstetric profiles. Body mass indices were calculated, and menses were evaluated. All subjects were submitted to a transvaginal ultrasound scan with a 7.5 mHz vaginal probe on day 9 of the menses to assess the endometrium, adenexa, ovaries, and pathologies. Diagnostic laparoscopy was performed in the postmenstrual phase with general anesthesia. The intraoperative assessment consisted of visualization of the uterus, ovaries, Fallopian tubes, pouch of Douglas, and ovarian fossae with chromopertubation with methylene blue dye for tubal patency. The data was analyzed using SPSS version 26. The descriptive statistical analysis was carried out using frequencies, percentages, and means ± SD. Fisher’s exact test was used to evaluate the correlation between TVS findings and laparoscopic findings, with statistical significance set to p < 0.05.

**RESULTS**

Table I shows that the majority of participants (75.8%) were 26-35 years old, with an overall mean age of 29.1±3.9 years. Most women had completed HSC education (56%) or higher (36.4%), and 87.9% were housewives. In terms of monthly household income, 54.5% earned between 35,001 and 70,000 BDT, 27.3% earned more than 70,000 BDT, and 18.2% earned less than 35,000 BDT. This distribution represents the largely middle-income, educated urban population seeking subfertility treatment at this tertiary center. (Table I).

**Table – I: Sociodemographic Characteristics of Subfertile Women (n = 66)**

| Variable             | Category           | n (%)      |
|----------------------|--------------------|------------|
| Age (years)          | ≤25                | 14 (21.2)  |
|                      | 26-35              | 50 (75.8)  |
|                      | >35                | 2 (3.0)    |
|                      | mean ± SD          | 29.1 ± 3.9 |
| Education            | Primary            | 1 (1.5)    |
|                      | SSC                | 4 (6.1)    |
|                      | HSC                | 37 (56)    |
|                      | Graduate and above | 24 (36.4)  |
| Occupation           | Housewife          | 58 (87.9)  |
|                      | Working woman      | 8 (12.1)   |
| Monthly income (BDT) | ≤35,000            | 12 (18.2)  |
|                      | 35,001-70,000      | 36 (54.5)  |
|                      | >70,000            | 18 (27.3)  |

Table II demonstrates that 60.6% of women experienced irregular menstrual cycles, whereas 74.2% had normal menstrual flow. Dysmenorrhea was found in 42.4% of cases, as was dyspareunia in 18.2%. Primary subfertility accounted for 69.7% of cases, with an average length of 4.48±3.3 years and a

mean marriage duration of 7.12±3.8 years. The high prevalence of monthly menstrual abnormalities and primary subfertility indicates severe underlying reproductive illness that necessitates a thorough diagnostic examination.

**Table – II: Menstrual and Obstetric Profile of the Study Population (n = 66)**

| Variable                         | Category  | n (%)      |
|----------------------------------|-----------|------------|
| Menstrual cycle                  | Regular   | 26 (39.4)  |
|                                  | Irregular | 40 (60.6)  |
| Menstrual flow                   | Scanty    | 12 (18.2)  |
|                                  | Normal    | 49 (74.2)  |
|                                  | Heavy     | 5 (7.6)    |
| Dysmenorrhea                     | Present   | 28 (42.4)  |
|                                  | Absent    | 38 (57.6)  |
| Dyspareunia                      | Present   | 12 (18.2)  |
|                                  | Absent    | 54 (81.8)  |
| Type of subfertility             | Primary   | 46 (69.7)  |
|                                  | Secondary | 20 (30.3)  |
| Duration of subfertility (years) | Mean ± SD | 4.48 ± 3.3 |
| Duration of marriage (years)     | Mean ± SD | 7.12 ± 3.8 |

Table III reveals that the mean BMI was 24.7±2.9 kg/m<sup>2</sup>, with 43.9% having a BMI ≥25 kg/m<sup>2</sup>. The most common comorbidities were thyroid diseases (21.2%), diabetes mellitus (18.2%), and hypertension (7.6%).

**Table - III: Anthropometric and Clinical Comorbidities of Participants**

| Variable                 | Category  | n (%)      |
|--------------------------|-----------|------------|
| BMI (kg/m <sup>2</sup> ) | <25       | 37 (56.1)  |
|                          | ≥25       | 29 (43.9)  |
|                          | mean ± SD | 24.7 ± 2.9 |
| Diabetes mellitus        | Present   | 12 (18.2)  |
| Hypertension             | Present   | 5 (7.6)    |
| Thyroid disorder         | Present   | 14 (21.2)  |
| Asthma                   | Present   | 1 (1.5)    |

Table IV shows that there are no statistically significant differences between TVS and laparoscopy in detecting PCOS (p=0.71), ovarian cysts (p=0.63), endometriosis (p=0.79), tubo-ovarian masses (p=1.00), normal results (p=0.16), or peritubal adhesions (p=0.24).

**Table - IV: Comparative Distribution of Pelvic Pathologies Detected by Transvaginal Sonography and Laparoscopy**

| Pelvic pathology            | TVS n (%) | Laparoscopy n (%) | p-value |
|-----------------------------|-----------|-------------------|---------|
| Normal findings             | 7 (10.6)  | 2 (3.1)           | 0.16    |
| Polycystic ovarian syndrome | 35 (53.1) | 37 (56.1)         | 0.71    |
| Ovarian cyst                | 12 (18.2) | 10 (15.2)         | 0.63    |
| Endometriosis               | 9 (13.6)  | 8 (12.1)          | 0.79    |
| Tubo-ovarian mass           | 3 (4.5)   | 2 (3.0)           | 1.00    |
| Peritubal adhesion          | 0 (0.0)   | 3 (4.5)           | 0.24    |

Table V (A) indicates Irregular menstrual cycle was the sole significant predictor of pelvic diseases on TVS (adjusted OR=3.21, 95% CI: 1.01-10.18, p=0.048). There were no significant connections found between age over 30 years, BMI ≥25 kg/m<sup>2</sup>, primary infertility, or prolonged subfertility duration. Table V (B) illustrates Irregular menstrual cycles were borderline significant (adjusted OR=2.87, p=0.07), whereas other characteristics such as age, BMI, subfertility type, and duration had no significant relationships with laparoscopic pathology diagnosis.

**Table - V: Logistic Regression Analysis of Factors Associated with Pelvic Pathologies Detected on Transvaginal Sonography and Laparoscopy**

| A. Logistic Regression Analysis of Factors Associated with Pelvic Pathologies Detected on Transvaginal Sonography (n = 66) |                   |         |                      |         |  |
|--|-------------------|---------|----------------------|---------|--|
| Predictor variable   | Crude OR (95% CI) | p-value | Adjusted OR (95% CI) | p-value |  |
| Age >30 years  | 1.21 (0.42-3.52)  | 0.73    | 1.18 (0.39-3.59)     | 0.77    |  |
| BMI ≥25 kg/m <sup>2</sup>  | 2.34 (0.79-6.91)  | 0.12    | 2.11 (0.69-6.44)     | 0.19    |  |
| Irregular menstrual cycle  | 3.68 (1.19-11.34) | 0.024   | 3.21 (1.01-10.18)    | 0.048   |  |
| Primary subfertility   | 1.54 (0.49-4.82)  | 0.46    | 1.41 (0.43-4.62)     | 0.57    |  |
| Duration of subfertility >5 years  | 1.89 (0.63-5.64)  | 0.25    | 1.67 (0.54-5.18)     | 0.37    |  |
| B. Logistic Regression Analysis of Factors Associated with Pelvic Pathologies Detected on Laparoscopy (n = 66)             |                   |         |                      |         |  |
| Predictor variable   | Crude OR (95% CI) | p-value | Adjusted OR (95% CI) | p-value |  |
| Age >30 years  | 1.42 (0.48-4.19)  | 0.52    | 1.36 (0.44-4.21)     | 0.59    |  |
| BMI ≥25 kg/m <sup>2</sup>  | 2.08 (0.71-6.05)  | 0.18    | 1.94 (0.65-5.83)     | 0.24    |  |
| Irregular menstrual cycle  | 3.12 (1.02-9.53)  | 0.046   | 2.87 (0.91-9.01)     | 0.07    |  |
| Primary subfertility   | 1.69 (0.53-5.42)  | 0.37    | 1.51 (0.45-5.05)     | 0.50    |  |
| Duration of subfertility >5 years  | 2.41 (0.81-7.17)  | 0.11    | 2.18 (0.71-6.69)     | 0.17    |  |

**DISCUSSION**

This study thoroughly assessed the pattern and distribution of pelvic diseases in subfertile women using both transvaginal sonography and diagnostic laparoscopy, offering important insights into their relative diagnostic value. Thus, the high rate of pathologically confirmed anomalies (89.4% for TVS and 96.9% for laparoscopy) clearly reflects the high significance of pelvic pathologies in the pathogenesis of subfertility in our population, in accordance with the high abnormality detection rates of 85-95%, which have been repeatedly found in subfertile females undergoing systematic investigation [14]. Polycystic ovarian syndrome was found to be the commonest pathology, which was revealed in 53.1% women by TVS,

followed by 56.1% by laparoscopy, showing excellent statistical correlation between the two procedures (p = 0.71). The prevalence of this study is consistent with Desai et al., who showed a prevalence between 40-60% of subfertile women to have PCOS [15]. The sensitivity indices using TVS to diagnose PCOS have shown excellent reproducibility to accurately detect PCOS, thereby validating it as a first-choice method to diagnose PCOS [16]. The correlation between irregular menstruation and pathologies revealed on TVS was an important predictive factor (Adjusted OR = 3.21, p = 0.048). However, striking diagnostic discordance emerged regarding peritoneal pathology. The peritubal adhesions, identified in 4.5% of participants by laparoscopy, were completely missed by TVS, a fundamental

limitation for any non-invasive imaging modality [17]. This finding concurs with Chen et al., who showed the clear superiority of laparoscopy in adhesions detection, with sensitivity ranging from 85-95%, in contrast to <20% for ultrasonography [18]. Detection of endometriosis also varied substantially (13.6% TVS versus 12.0% laparoscopy), although Meuleman et al. reported that the detection of endometriosis by laparoscopy in 25-50% of subfertile women [19]. This apparent underdetection may indicate early-stage disease or peritoneal implants not causing mass lesions visible on imaging. The 18.2% ovarian cyst detection rate by TVS versus 15.2% by laparoscopy likely represents functional cysts that resolved between examinations, emphasizing the timing-dependent nature of mean duration of subfertility of 4.48±3.3 years and high primary subfertility rate of 69.7% indicate late presentation that could have allowed the disease to progress with the formation of adhesions, thus explaining the observed high burden of peritoneal pathology [20]. Similarly, the prevalence of overweight/obesity was 43.9%, while diabetes was 18.2% in our study population, reflecting the epidemic metabolic syndrome prevalent in South Asia that is strongly associated with PCOS and subfertility [21]. A prevalence of 21.2% of thyroid disorders also needs consideration, as thyroid dysfunction significantly impacts reproductive outcomes and needs concurrency in management [22]. Although TVS and laparoscopy were statistically consistent in the detection of most pathologies (p-value > 0.05), the importance of their complementarities in practical application cannot be overruled either. TVS is best used for its virtues in observing ovarian morphology and anomalies, uterine abnormalities, and is therefore best used in initial assessments and screenings [23]. The unparalleled strength of laparoscopy in observing adhesions, tubal patency by chromopertubation, and endometriotic lesions makes it an essential tool in a complete subfertility workup evaluation [24]. The borderline significance of irregular menses for laparoscopic findings (p=0.07) implies that hormonal dysfunctions might play a role in the development of both ovarian and peritoneal pathologies. The lack of significant correlations for age, BMI, or duration of subfertility in the multivariate model could be indicative of our relatively homogeneous group or the need for larger sample sizes to detect such associations. Each of these findings argues for a systematic diagnostic procedure based on comprehensive evaluation, TVS screening, and selective laparoscopy for subfertility care in resource-poor environments.

### LIMITATIONS

This single-center study with a relatively small sample size may limit the generalizability of findings to broader populations. The time interval between TVS and laparoscopy could have allowed dynamic changes in pathology, particularly functional ovarian cysts, potentially affecting diagnostic concordance.

### CONCLUSION

This study found a very high prevalence of pelvic diseases among subfertile women, with PCOS being the most common finding, while peritubal adhesions were detected exclusively by laparoscopy. While transvaginal sonography is good at detecting ovarian and uterine diseases, particularly PCOS, it dramatically underestimates peritoneal abnormalities like adhesions, which are easily seen with laparoscopy. The statistical concordance between modalities for most illnesses suggests that they play complementary rather than interchangeable functions. Irregular menstrual cycles were identified as a strong predictor of pelvic disease, underlining the necessity of a complete menstrual history in clinical examination. A systematic diagnostic method that combines

TVS for initial screening and selected laparoscopy for comprehensive evaluation improves diagnostic accuracy while being cost-effective in resource-constrained environments.

### RECOMMENDATIONS

Future multicenter studies with larger sample sizes should validate these findings and develop evidence-based diagnostic algorithms integrating clinical parameters, TVS findings, and laparoscopy indications. Three-dimensional TVS and contrast-enhanced sonohysterography warrant investigation as intermediate modalities between conventional TVS and invasive laparoscopy for improved peritoneal pathology detection.

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### CONFLICT OF INTEREST

None declared

### ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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