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Patterns of Uterine Abnormalities Detected by Transvaginal Ultrasonography among Infertile Women: A Cross-Sectional Study in Bangladesh

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Abstract

Background: Uterine abnormalities are common but often underdiagnosed contributors to female infertility, and transvaginal ultrasonography provides a sensitive, non-invasive method to detect these structural pathologies-an area particularly relevant in Bangladesh, where infertility poses a growing reproductive health challenge. **Objective:** This study aimed to assess the presence and pattern of uterine abnormalities using transvaginal ultrasonography (TVS) in women presenting with infertility in a tertiary care hospital of Bangladesh. **Methodology:** This cross-sectional study was conducted from January to December 2020 at the Department of Reproductive Endocrinology and Infertility, Dhaka Medical College Hospital. A total of 98 women presenting with infertility and undergoing routine TVS were enrolled. Women with hormonal disorders or male factor infertility were excluded. Data on sociodemographic characteristics, reproductive and menstrual history were collected through face-to-face interviews using a semi-structured questionnaire. TVS findings were also recorded. **Results:** The mean age of participants was 30 ± 5 (SD) years; 67.0% resided in urban areas and 69.0% had primary infertility. Menorrhagia was reported in 54% and dysmenorrhea in 26.0% of participants. TVS revealed uterine pathologies in 93.0% of cases, with acquired causes being predominant. Fibroids were the most common finding (54.0%), followed by adenomyosis (28.0%). Other acquired abnormalities included endometrial polyps (6.0%), endometrial hyperplasia (4.0%), and intrauterine adhesions (1.0%). Congenital uterine anomalies were observed in 16.0% of women, with arcuate uterus being the most frequent (11.0%). Congenital uterine pathologies were more common in participants with primary infertility (21.0% vs 8.0%), while acquired uterine causes were more frequent in participants with secondary infertility (92.0% vs. 79.0%). No statistically significant association was observed ($p>0.05$). **Conclusion:** TVS identified a high prevalence of uterine pathologies, with fibroids and adenomyosis being the most common. *[Journal of National Institute of Neurosciences Bangladesh, January 2025;11(1):81--87]*

Keywords: Infertility, Transvaginal ultrasonography, Uterine abnormalities, Bangladesh, Female infertility

Introduction

Infertility is a global health issue that affects millions of couples and presents substantial medical, psychological, and social challenges, impacting both personal well-being and interpersonal relationships. Approximately 1 in 6 individuals of reproductive age experience infertility at some point in their lives, with female infertility contributing to nearly half of these cases1,2. Recent evidence points towards a significant increase in female infertility over the past decades. The number of cases increased from approximately 59.7 million in 1990 to over 110 million in 2021, reflecting an 84.4% surge[3]. Bangladesh is no exception, where the proportion of female infertility cases among couples seeking infertility treatment rose sharply from 43% in 2007 to 94.2% in 2024[4].

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Female infertility is a multifaceted condition with various underlying causes, and uterine pathology is one of them. These pathologies may include both acquired conditions, such as fibroids, polyps, or adhesions, and congenital anomalies like a septate or bicornuate uterus. A review of 188 studies reported that uterine factors accounted for approximately 2.1% to 16.7% of infertility cases[5]. The evaluation of female infertility is a systematic process aimed at identifying the underlying cause. This is a thorough assessment including detailed medical and reproductive history, physical examination, and targeted investigations to evaluate ovulatory status, uterine anatomy, and fallopian tube patency. A key focus of this evaluation is the comprehensive assessment of uterine pathologies, as these conditions may represent significant and potentially treatable contributors to infertility, necessitating accurate detection followed by appropriate management.

Transvaginal ultrasonography (TVS) is a cornerstone in the evaluation of uterine causes of infertility. It provides high-resolution imaging of the uterus and adnexa, allowing for the detection of any acquired or congenital condition of the uterus. TVS is non-invasive, offers real-time visualization, and is widely available in most specialized healthcare settings offering care for infertility. Hence, its accessibility is limited in low-resource health care settings of Bangladesh. Alternative imaging modalities such as hysteroscopy and transabdominal ultrasonography (TAUS) are also used. TAUS, though more widely available, offers lower resolution compared to TVS due to the positioning of the transducer farther from the pelvic organs. Previous reports also demonstrated a higher sensitivity and specificity of TVS for detecting structural causes of infertility in comparison with TAUS[6,7]. In a study, TVS demonstrated a sensitivity of 96.0% and specificity of 89.0% for detecting pelvic pathologies, while TAUS showed a sensitivity of 91.0% and specificity of 83.0%[8].

Hysteroscopy is considered the gold standard for evaluating intrauterine abnormalities due to its ability to provide direct visualization of the uterine cavity. Previous studies reported a higher sensitivity and specificity of hysteroscopy compared to TVS[9,10]. In a study, TVS demonstrated sensitivity of 57.7% and a specificity of 97.6%, while hysteroscopy provided a definitive diagnosis[11]. However, hysteroscopy is invasive, expensive, requires specialized expertise, and may not be feasible or accessible in all healthcare settings, particularly in resource-limited environments.

In Bangladesh, despite the increasing prevalence of infertility, comprehensive national-level data on the prevalence and specific patterns of uterine abnormalities remain scarce. This present study aimed to explore the patterns of uterine abnormalities detected through transvaginal ultrasonography among infertile women in Bangladesh. Due its high diagnostic accuracy, non-invasive nature, affordable cost transvaginal ultrasonography was selected as the primary imaging modality in this study. Findings from this study may guide the development of context-appropriate infertility management strategies.

Methodology

Study Design and Population: This study was conducted through a cross-sectional approach in the department of Reproductive Endocrinology and Infertility, Dhaka Medical College Hospital, Bangladesh. The study period spanned from January 2020 to December 2020. Women of reproductive age (18–40 years) presenting with infertility were approached for this study. Only those who were advised and underwent for transvaginal ultrasonography (TVS) as routine evaluation for infertility were considered for inclusion and a total of 98 women were enrolled following informed written consent. Participants were excluded from the study if they had male factor infertility, had not cohabited with their partner for at least 12 months, or had absolute or relative contraindications for TVS (active vaginal bleeding, pelvic infections, etc.). Patients with hyperprolactinemia, thyroid function abnormalities, vaginal causes of infertility, any underlying malignancy, or severe anemia were also excluded from the study.

Consenting and initiating data collection: Infertility is defined as the inability of a couple to achieve pregnancy after 12 months of regular (3–4 times per week), unprotected sexual intercourse in women under 35 years of age, or after 6 months in women aged 35 years and above[12]. Patients with both primary and secondary infertility were included in this study. Primary infertility refers to couples who could not conceive after at least 1year regular intercourse without using any birth control methods. Secondary infertility is the inability to conceive after previously giving birth to a baby. Prior to enrollment, all eligible participants were subjected to a detailed explanation of the study objectives, procedures, and their role in the research. Written informed consent was obtained from each participant before inclusion. Following consent, data were collected using a semi-structured, interviewer-administered questionnaire.

Face-To-Face Interview: All participants underwent

face-to-face interviews, which were conducted in a private setting to ensure confidentiality and comfort. Participants were asked regarding sociodemographic characteristics, menstrual and reproductive history, and history of contraceptive use. Scanty menstrual flow was defined as blood loss of less than 5 mL per menstrual cycle, or bleeding so minimal that it does not require routine menstrual protection. Average menstrual flow was defined as blood loss of 5 to 80 mL per menstrual cycle, typically requiring changing a pad or tampon every 4 to 6 hours during the heaviest days. Profuse menstrual flow was defined as blood loss exceeding 80 mL per menstrual cycle, or bleeding that soaks through a pad or tampon every 1-2 hours, interferes with daily activities, or is subjectively perceived as heavy by the patient[13].

Physical Examination: Height and weight of all participants were measured using a standard stadiometer and calibrated digital scale. Body mass index (BMI) was calculated for each participant. This formula was used for BMI- weight (kg) / height² (m^2). Asia-Pacific classification defined by the Western Pacific Regional Office of the WHO was used to categorize BMI where the categories are- underweight (<18.50 kg/m^2), normal (18.50–22.99 kg/m^2), overweight (23.00–24.99 kg/m^2), and obese (≥25 kg/m^2).

Transvaginal ultrasonography (TVS): All participants underwent transvaginal ultrasonography as a routine evaluation of infertility. TVS was conducted in the department of Nuclear Medicine and Allied Sciences, Dhaka Medical College by a single sonologist. A vaginal transducer was used while the vaginal probe was inserted into the vagina with the subject in the lithotomy position to obtain optimal imaging. The sonologist evaluated ovarian morphology, endometrial thickness, uterine size and contour, and the presence of any adnexal or pelvic pathology. All findings were recorded systematically for further analysis. The privacy and comfort of all participants was prioritized during the procedure. All data were collected in separate case record form.

Statistical analysis: Data were entered and analyzed using SPSS version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participants' sociodemographic and clinical characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean with standard deviation.

Ethical clearance: The study protocol was reviewed and approved by the Ethical Review Committee (ERC) (Current Institutional Review Board (IRB) Dhaka Medical College (DMC) (Ref. Memo No. ERC-DMC/ECC/2019/395(R) Date: 26/12/2019. The study was conducted in accordance with the 'Declaration of Helsinki'.

Results

The mean age of the study participants presenting with infertility was 30 ± 5 (SD) years, with the majority (56%) aged between 18 and 30 years. Around 67% resided in urban area and same percentage of women were primarily housewives. Highest educational attainment showed that over one-third having completed primary education and nearly a quarter being graduates. Regarding nutritional status, 47% women had normal body mass index with one-third of them being overweight and 10% being obese. Comorbid conditions like diabetes mellitus were observed in 18% and hypertension were observed in 8% of the participants (Table 1).

Table 1: Baseline Characteristics of the Study Participants (n=98)

Variables	Frequency	Percent
Age (years)		
≤30	55	56.1
31-40	42	42.8
>40	1	1.1
Mean±SD	29.9±5.3	
Residence		
Urban	66	67.3
Rural	32	32.7
Highest education attainment		
Illiterate	9	9.2
Primary school completed	35	35.8
Secondary school completed	22	22.4
Higher secondary college completed	10	10.2
Graduate	22	22.4
Occupation		
Housewife	66	67.3
Service	31	31.6
Business	1	1.1
Body mass index (kg/m2)		
Underweight	9	9.2
Normal	46	46.9
Overweight	33	33.7
Obese	10	10.2
Comorbidities*		
Diabetes mellitus	18	18.4
Hypertension	8	8.2

*Multiple responses considered

The mean age at menarche was 11± 1 (SD) years, with 42% experiencing menarche before 12 years of age. Almost three-fourth had regular menstrual cycles. The average duration of menstruation was approximately 4 days, with most women experiencing less than 5 days of bleeding. Menstrual flow was profuse in 54% of patients while one-third reported average bleeding. Menstrual abnormalities were common, with menorrhagia affecting more than half of the participants (54%) and dysmenorrhea reported by 26%. The average duration of conjugal life was 8 ± 4 (SD) years, and coital frequency averaged three times per week. Most women (71%) had no history of contraceptive use, while 29% had used contraceptives, including hormonal (17%) and non-hormonal methods (11%). Among those who used contraceptives, the mean duration of contraceptive use was 2 ± 1 (SD) years. Primary infertility was observed in 69% of study participants (Table 2).

Table 2: Reproductive History and Hormonal Parameter of the Study Participants (n=98)

Variables	Frequency	Percent
Age at menarche (years)		
<12	41	41.8
≥ 12	57	58.2
Mean ± SD (years)	11.5 ±1.0	
Menstrual cycle		
Regular	72	73.5
Irregular	26	26.5
Average duration of menstruation (days)		
<5	56	57.1
5-10	41	41.8
>10	1	1.1
Mean±SD (days)	4.4±2.1	
Menstrual flow		
Average	32	32.6
Scanty	13	13.3
Profuse	53	54.1
Menstrual abnormality		
No abnormality	15	15.3
Menorrhagia	53	54.1
Dysmenorrhea	26	26.5
Dysfunctional uterine bleeding	4	4.1
Duration of conjugal life (years)		
<5	35	35.7
5-10	45	45.9
>10	18	18.4
Mean±SD (years)	7.7±4.4	
Frequency of coitus (per week)		
Mean±SD	3.0±1.0	
Type of infertility		
Primary	68	69.4
Secondary	30	30.6
Contraceptive history		
No	70	71.4
Yes	28	28.6
Hormonal	17	17.3
Non-hormonal	11	11.2
Duration of contraceptive use (years)		
Mean±SD	2.1±1.5	

According to transvaginal ultrasonography, acquired uterine pathologies were more prevalent (93%). Fibroma or fibroids were the leading cause, found in more than half of the women (54%), followed by adenomyosis in 28%. Other abnormalities included endometrial polyps (6%), endometrial hyperplasia (4%), and intrauterine adhesions or synechiae (1%). Congenital uterine anomalies were observed in 16% of participants with arcuate uterus being the most common congenital anomaly (11%), and other anomalies such as uterine hypoplasia, didelphys, bicornuate, and septate uterus each accounting for 1% (Table 3).

Table 3: Causes of Infertility According to Transvaginal Ultrasonography (n=98)

Variables	Frequency	Percent
Congenital cause	**16**	**16.3**
Uterine hypoplasia and agenesis	1	1.1
Uterus didelphys	1	1.1
Bicornuate uterus	1	1.1
Septate uterus	1	1.1
Arcuate uterus	11	11.2
Acquired cause	**91**	**92.8**
Fibroma/Fibroid	53	54.1
Adenomyosis	27	27.6
Endometrial polyps	6	6.1
Endometrial hyperplasia	4	4.1
Intrauterine adhesions or synechiae	1	1.1

Table 4: Association Between Type of Subfertility and Uterine Causes of Subfertility (n=98)

Type of Uterine Pathology	Type of infertility		P Value
	Primary	Secondary	
Congenital	13 (21.0%)	3 (8.3%)	
Acquired	49 (79.0%)	33 (91.7%)	0.103
Total	62(100.0%)	36(100.0%)	

*p value was determined by Chi-square test

Congenital uterine pathologies were observed in 21% of women with primary infertility while it was observed in

8% of study participants with secondary infertility. Acquired uterine causes were more frequent in women with secondary infertility comparing to women with primary infertility (92% vs 79%). The was not statistically significant (Table 4).

Discussion

Infertility is not merely a medical condition affecting reproductive capacity, but a multifaceted public health issue that influences emotional well-being, marital harmony, and social acceptance, especially in low- and middle-income countries like Bangladesh. Identifying underlying causes, such as uterine abnormalities, is essential for timely diagnosis and appropriate management of female infertility. Transvaginal ultrasonography (TVS) is a non-invasive, cost-effective, and widely accessible imaging tool that plays a pivotal role in detecting uterine abnormalities among women presenting with infertility. In this study, TVS revealed 93.0% of infertile women had acquired a uterine factor responsible for infertility, which is consistent with similar studies conducted in other low- and middle-income countries.

In this study, the mean age of women presenting with infertility was 30 years which is consistent with other studies conducted in low and middle-income countries[14-16]. In Bangladesh, women often marry in their early twenties and seek care after a few years of unsuccessful conception attempts. Most of the women in the study resided in urban areas and were housewives. The educational profile revealed that one-third of them had not progressed beyond primary education. This is understandable, as the study was conducted in a government-funded tertiary care hospital located in the capital city, which primarily serves low- to middle-income populations with limited educational attainment. Almost half of the studied women had a normal body mass index, while one-third of them were overweight and 10.0% were obese. This distribution is comparable to national trends observed among women of reproductive age in Bangladesh, where rising rates of overweight and obesity are increasingly reported, particularly in urban populations[17]. About 18.0% of infertile women had diabetes mellitus and 8.0% had hypertension.

The women in this study reported a mean age at menarche of 11 years, which aligns with previously reported averages among Bangladeshi women[18]. Approximately three-fourths of participants had regular menstrual cycles consistent with the typical pattern. However, menorrhagia was reported in more than half of the study participants and dysmenorrhea was present in one-fourth of them. While few studies have attempted to explore the association between infertility and menstrual patterns[19,20], the existing evidence remains inconclusive. The average duration of conjugal life was 8 years, and the average coital frequency was three times per week. More than two-thirds didn't use any contraceptive. Among the rest hormonal methods were the most common. Primary infertility was more prevalent presenting in 69% of the studied participants. Similar findings have been reported in study conducted in Bangladesh[21].

All study underwent evaluation for uterine cause of infertility through transvaginal ultrasonography. About 93.0% of studied women were reported with acquired uterine pathologies, with fibroids being the most common with a percentage of 54.0%, followed by adenomyosis (28.0%). Less frequent abnormalities included endometrial polyps, endometrial hyperplasia, and intrauterine adhesions. The prevalence of fibroids in infertile women has been reported to be around 5.0% to 10.0%, while they are considered the sole cause of infertility in approximately 1 to 3% of cases[22,23]. In the present study, couples with hormonal abnormalities or male factor infertility were excluded to focus specifically on uterine causes, which may explain the higher prevalence of fibroids and other structural pathologies compared to other studies. A study focusing only the TVS findings of females with infertility reported 19.7% fibroids[24]. Adenomyosis also considered to reduce the chance of pregnancy by 28.0% compared to those without the condition[25,26]. Congenital uterine anomalies were observed in 16.0% of participants with arcuate uterus being the most common congenital anomaly (11%)[27]. This study observed congenital uterine pathologies as more common in women with primary infertility compared to those with secondary infertility, although this difference did not reach statistical significance. In contrast, acquired uterine causes were notably more common in women with secondary infertility.

However, this study has several limitations. As a single-center, hospital-based study, the findings may not be generalizable to the broader population. The cross-sectional design also limits the ability to establish causal relationships.

Despite of limitations, this study's findings with higher rates of acquired uterine pathologies detected by TVS underscore the need for early screening and accessible

infertility services in low-resource settings.

Conclusion

Transvaginal ultrasonography revealed that nearly all participants had uterine pathologies, with fibroids and adenomyosis being the most common. The studied women with infertility were mostly suffering for primary infertility. These findings highlight the importance of thorough evaluation using transvaginal ultrasonography and the need for targeted reproductive health interventions in this population.

Abbreviations

TVS - Transvaginal Ultrasonography
TAUS - Transabdominal Ultrasonography
BMI - Body Mass Index
DMC - Dhaka Medical College
IRB - Institutional Review Board
ERC - Ethical Review Committee

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Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
The study was approved by the Ethical Review Committee (ERC) (Current Institutional Review Board (IRB) Dhaka Medical College (DMC) (Ref. Memo No. ERC-DMC/ECC/2019/395(R) Date: 26/12/2019. Informed signed consent was obtained from all eligible participant who agreed to participate. The authors declare no human subjects were harmed and the procedures followed were in accordance with the ethical standards and regulations established by the Helsinki Declaration of the World Medical Association.

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