

## Role of Transvaginal Ultrasonography in the evaluation of Uterine Fibroids: a regional observation in Bangladesh.

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### Abstract

Uterine fibroids, also known as leiomyomas, are the most common uterine neoplasms. Although benign, they can be associated with a significant number of morbidity and are the most common indication for hysterectomy. Transvaginal ultrasonography (TVS) has become essential in the diagnosis and management of the uterine fibroids. TVS provides a detailed examination of uterus and ovaries. However, there is no nation-wide and regional clinical study on the use of TVS for the evaluation of uterine fibroids in Bangladesh. In this work, a cross-sectional study toob serve the role of TVS in the evaluation of uterine fibroids in a region of Bangladesh (Greater Mymensingh). In the diagnosis of uterine fibroids by TVS, we observed that 35(81.4%) cases (out of 43) are fibroids and 8 (18.6%) cases are non-fibroids. In histopathological diagnosis, we found 36 (83.7%) cases are uterine fibroids, and 7 (16.3%) cases are without fibroids. In this study, TVS diagnosed uterine fibroids with a sensitivity of 94.4%, the specificity of 85.71%, the accuracy of 97.6%, the positive predictive value of 97.1% and negative predictive value of 75%. The results demonstrate that TVS has the potential to become a useful imaging tool for the evaluation of uterine fibroids.

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**Key words:** Transvaginal ultrasonography, Uterine fibroids.

### Introduction

Uterine fibroids also are known as leiomyomas or myomas, are the most prevalent uterine neoplasms. They are benign tumours of smooth muscle origin with varying amount of fibrous connective tissue Wilde and Scott-Barrett (2009). Atleast 20% of all women and 40% of women over the age of 40 years have uterine lieomyomas Ibrar F (2010). Fibroids can be found inside an intramural myometrial wall, bulging into the endometrial cavity (submucosal), positioned almost entirely inside the endometrial cavity (intracavitary) or on the uterine surface Aflatoonian (2011); Podar (2008). Subserosal leiomyomas may be beneath the uterine surface as exophytic or pedunculated Yeh (1999). The leiomyomas are hormone-dependent neoplasia to both estrogen and progesterone Rein et al. (1995). Estrogen and progesterone receptors are in higher concentrations in leiomyomas than in the normal surrounding myometrium. The growth rate of leiomyomas is related to their numberof estrogen and progesterone receptor

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Walker and Stewart (2005); Murase et al. (1999). They often increase in size during pregnancy and usually after menopause. Early age at menarche and obesity are risk factors for the development of fibroids as they increase exposure to estrogen Jr.(1995). The majority of women with fibroids are asymptomatic. However, 20%-50% of them had symptoms such as menorrhagia, pelvic pain, and infertility or complication during pregnancy Chaparala et al. (2004); Wallach and Vlahos (2004). A large fibroid can present as an abdominal mass or with symptoms secondary to mass effects such as constipation and urinary frequency or retention Sudderuddin et al. (2014).

The presence of symptomatic fibroids is the most common hysterectomy indication, accounting for roughly one-third of those performed. Surgery is traditionally the treatment for fibroids. However, treatment with uterine artery embolization (UAE) has been performed more and more in recent years and has been effective in traditional surgery. UAE is an option when uterine preservation is desired or when a patient is unable to an open surgical procedure. Often treatment options include myomectomy or administration of gonadotropin-releasing hormone (GnRH) analogue.

Sonography is the most cost-effective procedure for confirming the myomas diagnosis. Sonography, however, may not detect small lesions and may be inaccurate in identifying exophytic subserosal myomas and distinguishing myomas from leiomyosarcomas Sudderuddin et al. (2014). Transvaginal sonography is the technique with the most readiness and cost-effectiveness. This can also help in the differentiation of myomas from other pelvic conditions. Transvaginal sonography scans for the diagnosis of small fibroids more sensitive, but when the uterus is bulky or retroverted uterine fundus may lie outside the field of view Parker (2007).

TVS has a high sensitivity for detecting myomas in a uterus of fewer than ten weeks size.

The use of high-frequency probes improves the sensitivity for diagnosing small myomas. However, their precise location respect to the uterine cavity of ten remains uncertain Prayson RA (1995).

Sonographic appearance of myomas can be variable, but frequently they appear as well-defined symmetrical hyperechoic and heterogeneous masses. However, areas of calcification or hemorrhagic may appear anechoic. Sonography may be inadequate for determining the precise number and position of myomas. However, TVS is reliable for less than 375ml within a total volume or containing four or fewer myomas Ferreira (1971). Leiomyomas are benign tumours predominantly composed of smooth muscle cells separated by variable amounts of fibrous connective tissue Garg et al. (2011); Ferdows et al. (2017); Bhatiyani et al. (2018); Woźniak and Woźniak (2017).

It is clear from the above discussion is that TVS has the potential to detect leiomyomas or uterine fibroids, and generally, sonography machines are available in most places of Bangladesh. However, TVS is not an established method for detecting uterine fibroids in Bangladesh Ferdows et al. (2017) and few studies, specific to a region or districts are available. For example, in a recent study Ferdows et al. (2017), authors have used Ultrasound for in fertility study in a region of Dhaka city. In this study, aim to demonstrate TVS as sensitive and effective modality in the diagnosis and mapping of uterine fibroids. This study provides reliable and relevant information for the diagnosis, and accurate uterine fibroid count, location, and measurement. The study results also have the potential to motivate and assist doctors and patients in improving treatment planning, such as embolization of the uterine artery as minimally invasive surgery.

### Materials and Methods

This cross-sectional study was carried out in the Department of Radiology and Imaging, Mymensingh Medical College Hospital, Mymensingh, from July 2012 to June 2014.

The research protocol was approved by the thesis committee (Local ethical committee). The objectives of the study, along with its procedure, alternative diagnostic methods, risks and benefits of this study were explained to the patients in an easily understandable local language. Then informed consent was taken from every patient. We assured that all information and records would be kept confidential and the procedure would be helpful for both the physician and the patients in making rational approach of patient management. In this study considered a total of 43 women ages 21 to 50 years in the study. They were referred by the outpatient department (OPD) and inpatient department of the hospital to the Department of Radiology and Imaging for transvaginal ultrasonography to detect uterine fibroids. Patients were selected by followings:

**Inclusion criteria:**

Patient having clinical manifestation of uterine fibroids.

**Exclusion criteria:**

- Patient who refused TVS examination,
- Histopathology report was unavailable,
- Have a huge fibroid and
- Patients who refused to do surgery.

**a. Method of Transvaginal Ultrasonography**

In this study Medison Sonoace X8 with a 7 MHz transvaginal transducer used in the transvaginal sonography. The urinary bladder needs to be empty to bring the pelvic organs into the focal zone of the transvaginal transducer. A female staff member was present in the lab room during the entire examination to act as a chaperone.

The transducer is prepared with ultrasound coupling gel and then covered with a protective sheath, usually a condom. Air bubbles were eliminated to avoid artifacts and then applied an external lubricant to the outside of the protective covering. Finally, the transducer was inserted into the vagina with the patient's supine. Knees gently flexed and hips elevated slightly on a pillow. The elevated hips allow free movement of the transducer by the operator. With gentle

rotation and angulations of the transducer, both sagittal and coronal images can be obtained. Following the examination, the transducer is removed from the vagina with the sheath intact. The sheath is discarded and the transducer is cleaned of gel. The transducer is then immersed in a disinfectant, according to the manufacturers preferred method.

**Results**

In this study produced two different set of results from the study: (i) for the studied sample (43 patients) Figure 1 and Table 1, and (ii) for the studied fibroid sample (35 patients)- Tables 2, 3 and 4.

Analysed the age distribution of the study patients. Majority of the patients were found in the age group 4th decade, which was 19 (44.2%) and the mean age was 37.7 with standard deviation 7.3 years with a range from 21 to 50 year. We observed the patients' common symptom and found that excessive per vaginal during menstruation in 36 (83.7%) patients, 26 patients had lower abdominal pain (60.5%), 17 (39.5%) patients had a lump in the lower abdomen, 15 (34.8%) patients had dysmenorrhoea. Postmenopausal bleeding and subfertility were seen in 7(16.2%) patients.

Table 1 and Figure 1 present the result of TVS diagnosis. As shown in the figure and table, 35 (81.4%) of the patients detected with fibroids and 8 (18.6%) detected with Non-Fibroid (NF). Specifically, out of the 8 NF patients, 4(9.3%) were detected with adenomyosis, 2(4.6%) with a bulky uterus and 2(4.6%) with an endometrial polyp. On the other hand, out of the 35 fibroids patients, 23 (65.7%) cases appeared as hypoechoic, 10 (28.6%) cases as a mixed echoic pattern and 2 (5.7%) cases as calcification. We also found that 25 cases (71.4.7%) of the fibroids cases were intramural fibroids, 08 (22.9%) cases were Submucosal fibroids, and 2 (5.7%) were subserosal fibroids. The posterior wall of the uterus was involved in 16 cases (45.7%) & anterior wall was involved in 10 (28.6%) cases of the fibroids. Both walls are involved in 07 (20%) cases, and the

fundus is involved in 2 (5.7%). Finally, we observed the size and number of fibroids in the patients, and these are discussed in the discussion section.

Table 1: Distribution of the patient (n = 43) by TVS Diagnosis

USG findings	Number	Percentage (%)
Fibroid	35	81.4%
Adenomyosis (NF)	04	9.3%
Bulky uterus (NF)	02	4.65%
Endometrial polyp (NF)	02	4.65%
Total	43	100%

Table 2: Distribution of the fibroid patients (n = 35) based on appearance

Appearance of fibroids	Number	Percentage (%)
Hypoechoogenic mass	23	65.7%
Mixed echogenic mass	10	28.6%
Calcification	2	5.7%
Total	35	100%

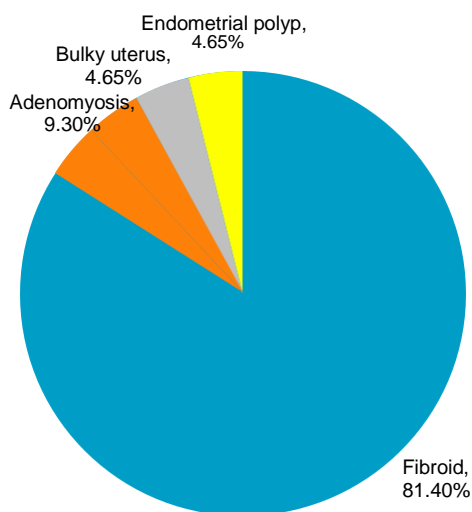


Figure 1: Distribution of patients according to TVS diagnosis (n=43).

Table 3: Comparison of transvaginal USG diagnosis with histopathological diagnosis of uterine fibroids (n=35).

Sonographic diagnosis	Histopathological diagnosis		Total
	Fibroid	Non-fibroid	
Fibroid	34(TP)	01(FP)	35
Total	34	01	35

Table 4: Validity test for uterine fibroid.

Validity test	Percentage
Sensitivity	94.4
Specificity	85.71
Accuracy	97.6
Positive predictive value	97.1
Negative predictive value	75

Table 3 shows histopathological findings and TVS evaluation among 43 patients having a manifestation of fibroid. In TVS evaluation of uterine fibroids out of 43 cases true positive 34 and false positive 1, false negative 2 and true negative 6 cases.

Table 4 presents the results of the validity test of our study in terms of Sensitivity (94.4%), specificity (85.71%), positive predictive value (97.1%), negative predictive value (75%), and accuracy was 97.6%.

## Discussion

Transvaginal Sonography is a new imaging modality that is rapidly gaining acceptance among radiologist and obstetricians. This study was carried out with an aim to evaluate the role of transvaginal sonography in the diagnosis and evaluation of uterine fibroids in terms of localization, number and measurement. A total number of 43 consecutive patients (21-50 years) having suspected uterine fibroids who came in the department of Radiology & Imaging of Mymensingh Medical College Hospital, Mymensingh, during the period of July 2012 to June 2014 were included in this study.

In this study, it was observed that the mean age of the patients was  $37.6 \pm 7$  years and most of the patients having the fourth decade, which closely resembled with

existing studies. For example, in Zhang et al. (2010) the mean age of the patients having uterine fibroids was  $39.4 \pm 6.9$  year. Eight years range 30 to 49 years of the patients having uterine fibroids, on the other hand, Zaher et al. (2009) and Rajan et al. (2011) have higher mean age in their patients having uterine fibroids, which were 42.8 years and 43.8 years respectively they have stated that the higher age range may be due to increasing life expectancy in their study patients.

Fennessy and Tempany Fennessy and Tempany (2006) found in their study that Ultrasonography is usually good at demonstrating well defined hypoechoic mass. Ultrasonography may demonstrate focal increase echogenicity if the calcification is present as it provides good inherent tissue contrast. In our study, the appearance of fibroids in TVS, we observed that hypoechoic mass in 65.7% patients, mixed echogenic in 28.6% and calcification in 5.7% patients.

The number of uterine fibroids was evaluated by TVS. Most of the fibroids patients (54.2%) had uterine fibroid, which is consistent with existing studies, including Zaher et al. (2009); Zhang et al. (2010). For example, authors in Zaher et al. (2009) found that patients with single fibroid were 61.0% and with multiple fibroids was 39.0%. Similarly, Zhang et al. (2010) showed the single fibroid was more common in their studied patients.

In this study, we have identified the location of uterine fibroids by TVS. We found that most of the uterine fibroids were in the posterior wall of the body, which is 45.7%. Other locations were the anterior wall of the body (28.6%), both wall (20%) and fundus (5.7%). Locations of fibroids in our studied patients are little different from the existing study Zhang et al. (2010). In the study, 38.1% fibroids were located at the anterior wall of the uterus, 23.8% at the posterior wall of the uterus, 33.3% at the fundus, and 14.3% at the lateral wall.

We also measured the size of the uterine fibroids by TVS. The mean size was  $3.7 \pm 1.6$  cm with a range from 1.9 to 7.5 cm. Authors in an existing study Zhang et al. (2010) measured the fibroid size, and according to their study, the mean size of fibroids was  $6.0 \pm 1.6$  cm range, 2.99.5 cm in the greatest diameter. This study slightly differs with our study, and this may be due to geographical variation or early presentation.

We have identified the type of uterine fibroid of the patients using TVS.

According to our observation, 22.9% was Submucosal, almost two-third 71.4% was Intramural, and 5.7% was Subserosal type. Also, we found 18.7% of patients had no fibroid. Similar to our study, authors in Volkert et al. (2008) identified that out of fibroid patients, 25.0% was submucosal, 65% was intramural, and 10% was the subserosal type.

Finally, we have run a validity test for our study. The sensitivity was 94.4%, specificity was 85.71%, accuracy was 97.6%, positive predictive values were 97.1%, and the negative predictive value was 75%. The validity test results were comparable to existing study Becker et al. (2002).

From the results of this study and the observations found in several existing studies, it can be concluded that transvaginal sonography is a useful, cheap and safe imaging modality to evaluate uterine fibroids.

## Conclusion

Transvaginal ultrasonography is a safe and effective method of detecting uterine fibroids. It is suitable for pelvic organ imaging because of its high availability, portability, versatility, lack of reliance on organ function and lack of ionizing radiation. With TVS as an initial imaging modality, time and cost to arrive at diagnosis can be significantly reduced. However, it has a range of diagnostic problems, and associations with clinical, radiological and histological results are helpful in achieving the correct diagnosis.

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## Declarations

Conflict of interest: No conflict of interests.

Authors' Contribution: Muktadira (student) did the collection and result analysis. A. S. M. Mahbubur Rahman is the co-supervisor of the project. MutaTahHira helped in reviewing the paper, and M. A. Razzaque formatted the paper in latex (JBA format) and reviewed it.

Ethical approval: Ethical clearance for this study was taken from "Mymensingh Medical College Hospital, Mymensingh, Bangladesh" as appropriate.

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