

# Evaluation of Abnormal Uterine Bleeding and Critical Analysis of Diagnostic Modalities

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## ABSTRACT

**Aim:** The purpose of this prospective study was to compare various diagnostic modalities in the evaluation of abnormal uterine bleeding (AUB) and judging the place of hysteroscopy (HYS) in obtaining the cause of AUB. This is done by correlating the findings on HYS and those found on dilation and curettage (D&C) and transvaginal sonography (TVS).

**Materials and methods:** This prospective study was performed in the Department of Obstetrics and Gynecology, Indira Gandhi Government Medical College and Hospital, Nagpur, Maharashtra, India. In this study, 60 cases of perimenopausal age group with AUB were chosen based on inclusion and exclusion criteria. The patients were subjected to routine investigations, TVS, HYS, and D&C in proliferative phase. The findings of the three were statistically analyzed by comparing with final histopathology diagnosis and test performances were calculated.

**Results:** Abnormal uterine bleeding was the commonest between 40 and 44 years (44%). Menorrhagia was the commonest presenting complaint (46%). Hysteroscopy was a better diagnostic tool than TVS and D&C for focal lesions. The diagnostic ability of HYS was higher, with sensitivity of 90.57% and specificity of 85.7% and diagnostic accuracy of 90% than TVS (sensitivity 79%, specificity 71.4%, and diagnostic accuracy 78.3%) in diagnosing intrauterine lesions in AUB.

**Conclusion:** This study reveals that HYS is superior in evaluating patients with AUB, when compared with D&C and ultrasonography (USG). Office hysteroscope, wherever available, must be used for evaluation of patients with AUB as an outpatient department (OPD) procedure along with clinical examination.

**Clinical significance:** There is rampant use of multiple diagnostic modalities in a single patient with AUB. So the need of the hour is to narrow down to a single diagnostic modality with maximum efficacy. There is a conflict between clinicians over use of TVS and HYS as a primary modality during evaluation of AUB. In this study, we attempted to find a solution.

**Keywords:** Abnormal uterine bleeding, Histopathology, Hysteroscopy, Perimenopausal women, Transvaginal sonography.

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## INTRODUCTION

Abnormal uterine bleeding (AUB) is a common problem of perimenopausal women. Menstrual dysfunction is the cause of discomfort, inconvenience, and disruption of healthy lifestyle. Around 12% gynecological outpatient department (OPD) visits are for AUB and 25% of gynecological surgeries are due to AUB. There are various diagnostic modalities available in the market, ranging from traditional dilation and curettage (D&C), transvaginal sonography (TVS), hysteroscopy (HYS) to saline infusion sonography (SISI). Dilation and curettage is the most widely used simple daycare procedure for histological evaluation of the endometrium. It was once considered as the gold standard of investigating women with AUB. Transvaginal sonography being noninvasive, painless, simple, and cost-effective procedure is often preferred as first investigation in the evaluation of AUB. On TVS, anatomy of pelvis structures and adnexae is better delineated. Hysteroscopy, on the contrary, gives direct visual access into the uterine cavity, and the area in question can be biopsied for more accurate diagnosis. In the present era of increased cost awareness and risk/benefit ratio, it becomes very vital to pick the most effective modality for evaluation of AUB. For risks related to invasive procedure like trauma, sepsis, need of anesthesia for HYS, a balance needs to be achieved between the practice of randomly prescribing all the investigations *vs* a stepwise or condition appropriate approach.

The present study was undertaken to compare the accuracy of the most commonly used diagnostic modalities in the evaluation of AUB, in an attempt to narrow down the list of investigations required and find a modality, i.e., more cost-effective and less invasive. It will also help to know the women who are likely to be benefited most by the invasive procedure of HYS.

## MATERIALS AND METHODS

This was a prospective comparative study conducted after taking institutional ethical committee approval,

between July 2012 and July 2014. In this study, 60 women were enrolled that met the required criteria. Women in perimenopausal age group (40–55 years) presenting with AUB were included, while exclusion criteria were pregnancy and its complications, like uterine bleeding due to systemic disorder like liver dysfunction, thyroid disease, renal disease, and bleeding disorders, and any drug-induced bleeding. Women with local causes of bleeding (vaginal and vulval pathology), patient with carcinoma cervix, and women on hormone replacement therapy and pelvic inflammatory disease were also excluded.

The study procedure was explained to all the women. Written, informed, valid consent was taken. Relevant clinical examinations with detailed past and family histories were taken. Routine blood investigations and PAP smear were done. All women were further assessed by performing a transvaginal ultrasonography (USG) at initial presentation.

### Ultrasonography

Ultrasonography was performed by a senior radiologist using 7 MHz TVS probe on “Phillips HD 11” machine. Pelvic anatomy was studied. Dimensions of uterus, ovaries, adnexal masses, endometrium thickness, and intracavitary lesions were noted. Specific notes regarding the presence or suspicion of fibroid, polyp, hyperplasia, malignancy, and any other pathology were documented.

### Hysteroscopy

Hysteroscopy was done under intravenous (IV) anesthesia postmenstrually, in early proliferative phase, by consultant gynecologist. A 4 mm rigid fiberoptic hysteroscope, manufactured by Creative Eye India, with 5 mm sheath was used. Normal saline was used as distension media aided by a hysteroflator. Misoprostol 200 mg was inserted into vagina, 3 to 4 hours before procedure to allow easy dilation of cervix. Hysteroscopy findings were documented. Women then underwent curettage in same sitting and endometrium was sent for histopathological examination. Antibiotic prophylaxis was given if indicated. A specific note was made of any focal lesion seen in terms of impression of an endometrial polyp, submucous fibroid, intramural fibroid, suspicion of hyperplasia, or endometrial carcinoma. Women were followed up with histopathology report and further treatment was planned.

Findings of HYS and TVS were compared with final diagnosis obtained from histopathology reports of resected focal lesions and hysterectomy specimens. Test performance of each diagnostic modality was calculated by standard sensitivity and specificity formula.

## RESULTS

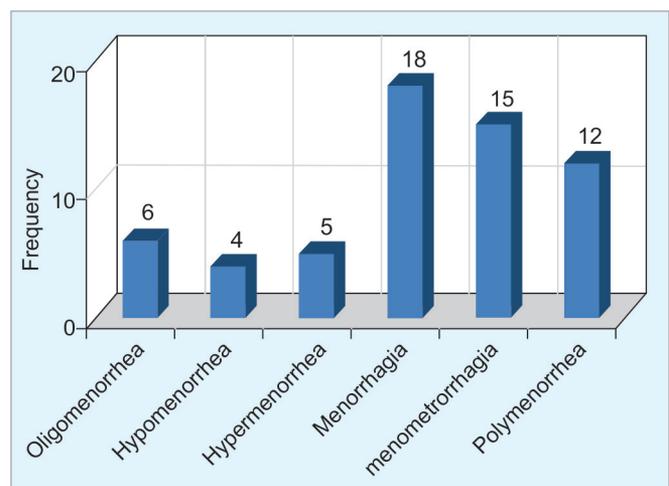
Information of these 60 women was collected. In the present study, maximum number of women, 33 (55%), were from the age group 40 to 44 years. Majority (67%) had chronic AUB, with 24 (40%) women having AUB for more than 1 year, followed by 20 (33%) women who had AUB since <6 months. Shortest duration of symptoms was 2 months and longest duration was 4 years. Frequency of clinical presentation is shown in Graph 1. Menorrhagia, 18 cases (30%), was the commonest presentation followed by menometrorrhagia with 15 cases (25%).

In the present study, all the women were anemic and maximum number of women [30 (50%)] were severely anemic according to the World Health Organization severity assessment,<sup>1</sup> followed by moderate anemia [26 (43%)] and mild anemia [4 (7%)]. Out of all women who had severe anemia, 5 (10%) women had Hb < 5 gm%. Lowest Hb was 3.8 g/dL. This patient required six blood transfusions before doing HYS and underwent hysterectomy due to failure of response to medical management.

On TVS, 16 (27%) cases had no intrauterine abnormality. Transvaginal sonography was good in defining the endomyometrial echotexture and anatomy of adnexa, in addition to uterine cavity. Six cases were detected to have coexistent simple ovarian cysts. Intrauterine lesions were detected in 44 (73%) cases.

Endometrial hyperplasia was seen in totally 25 cases, out of which 13 (22%) cases were hyperplasia with no other associated intrauterine lesion and rest 12 cases were hyperplastic endometrium with associated intrauterine lesion, and these cases were not shown in tables to avoid technical error.

Out of 15 fibroid diagnosed on TVS, only 9 were submucous fibroids, 3 were multiple fibroids (submucous, subserosal, and intramural), and 3 were intramural fibroid. Both the cases of adenomyosis were picked up by TVS. During the procedure, there was no other



Graph 1: Distribution of cases according to clinical presentation

significant complaint by the women other than vague pelvic discomfort. The diagnostic performance of TVS along with number of cases detected for each pathology is shown in Table 1.

**HYSTEROSCOPY**

Diagnostic performance of HYS and case distribution of each pathology is shown in Table 2.

In the present study on HYS, abnormal findings were seen in 49 (82%) and normal findings were seen in 11 (18%). Most common intrauterine abnormality seen was endometrial polyp [15 (25%)], followed by submucous fibroid [14 (23%)]. Polyps were seen as soft intracavitary formation, pink to grayish in color, soft, oval, pedunculated with a smooth glistening surface, which can be easily mobilized and covered by mucosa with endometrial gland and no distended vascular network. Submucous fibroid was seen as firm intracavitary formation with thin endometrial lining and superficial large blood vessels, and all the cases were diagnosed accurately by HYS.

Hyperplasia was seen in 14 cases (23%) as thick hypervascular friable mucosa, mammilated or polypoid in appearance. One of the two cases of adenomyosis was reported as normal. Atrophic endometrium appearing as thin fragile and flat surface was seen in four cases (7%). Hysteroscopy was fairly accurate in diagnosing endometrial polyp, submucous fibroids, and atrophic

endometrium with high sensitivity and specificity. Hysteroscopy appeared to be safe in our study, without any complications.

All the cases with intrauterine lesions, submucous fibroid, endometrial polyp were managed surgically, hysteroscopic myoma/polyp resection, or hysterectomy. Fifty cases underwent hysterectomy due to failure to respond to medical treatment.

**DILATATION AND CURETTAGE**

The most common abnormality detected on D&C was hyperplasia [16 (27%) cases], followed by endometrial polyp [6 (10%) cases], as shown in Table 3. Only 2 (3%) cases of fibroids were detected by curettage. There were 2 (3%) cases of endometritis detected by curettage (histopathology) with 100% accuracy. Two (3%) cases showed inadequate sample, so the result could not be obtained.

On comparing overall diagnostic performance of each modality, as shown in Table 4, hysteroscope was found to be most sensitive and specific, followed by TVS. In a case of AUB, D&C had high specificity, but poor sensitivity in detecting intrauterine pathology.

**DISCUSSION**

As women approach menopause, their hormones go out of balance and so they experience changes in their menstrual bleeding patterns, which might have an effect on the quality of life index. More often than not,

**Table 1:** Distribution of cases on TVS in comparison to final diagnosis showing sensitivity (S), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV)

Etiology	No. of cases		TVS				S	Sp	PPV	NPV	DA
	TVS	Final diagnosis	True		False						
			+(A)	-(D)	+(B)	-(C)					
Normal	16	7									
Hyperplasia	13	17	11	29	24	6	64.7	67.4	40	82.8	66.6
Endometrial polyp	10	15	8	43	2	7	53	95.5	80	86	85
Submucous fibroid	12	14	7	41	5	7	50	89	58	85	80
Adenomyosis	2	2	2	58	0	0	100	100	100	100	100
Atrophic	4	4	3	55	1	1	75	98.2	75	98.2	98

**Table 2:** Distribution of cases on HYS in comparison to final diagnosis showing sensitivity (S), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV)

Etiology	No. of cases		HYS				S	Sp	PPV	NPV	DA
	HYS	Final diagnosis	True		False						
			+(A)	-(D)	+(B)	-(C)					
Normal	11	7									
Hyperplasia <sup>a</sup>	14	17	14	38	5	3	82	88	74	93	87
Endometrial polyp	15	15	15	45	0	0	100	100	100	100	100
Submucous fibroid	14	14	14	46	0	0	100	100	100	100	100
Adenomyosis	1	2	1	58	0	1	50	100	100	98	98
Atrophic	4	4	4	56	0	0	100	100	100	100	100
Endometritis	1	2	0	58	0	2	50	100	100	98	98

<sup>a</sup>There were 19 cases of hyperplasia; only 14 cases were pure hyperplasia with no other associated intrauterine lesions

**Table 3:** Distribution of cases on D&C in comparison to final diagnosis showing sensitivity (S), specificity (Sp), positive predictive value (PPV), and negative predictive value (NPV)

Etiology	No. of cases		D&C				S	Sp	PPV	NPV
			True		False					
	D&C	Final diagnosis	+(A)	-(D)	+(B)	-(C)				
Normal	29	7								
Hyperplasia	16	17	16	43	1	0	94	100	100	97.7
Endometrial polyp	6	15	06	45	09	0	40	100	100	83
Submucous fibroid	2	14	02	46	12	0	14	100	100	79
Atrophic	3	4	3	56	1	0	100	100	100	100
Endometritis	2	2	2	58	0	2	100	100	100	100

**Table 4:** Comparison of diagnostic performance of various modalities

	TVS (%)	Hysteroscopy (%)	D&C (%)
Sensitivity	77	90.5	58
Specificity	57	85.7	100
PPV	93	97.9	100
NPV	25	54.5	24
DA	75	90	63

these changes can be managed conservatively till she approaches her last menstrual period. Surgical interventions are required rarely, especially in cases who fail to respond to medical management. In low-resource areas, where women are poor, noncompliant, and ignorant, need for surgery increases. In such cases, subjecting women to battery of investigations for diagnosis would mean increase in cost and sufferings of patient, which is not desired. But it is important to determine the exact cause not only to initiate appropriate treatment but also to rule out malignancy in high-risk groups.

In today’s era of minimal invasive surgery, cause of abnormal uterine bleeding can be diagnosed as well as managed in the same setting by HYS. However, HYS has its own limitations; it requires a surgical expertise and need for anesthesia besides the cost of surgery and hospital stay in case of inpatient procedure. Transvaginal sonography, although brings about indirect assessment of intrauterine cavity, is a safe, sensitive, cost-effective, and noninvasive tool for mapping structural pathologies in AUB. The present study was undertaken to evaluate the role of two commonly employed diagnostic methods in the investigation of AUB.

The age group in this study was between 40 and 55 years, and the maximum incidence was found to be between the ages of 40 and 44 years (55). Tahir et al<sup>2</sup> studied 400 women, all were above the age of 35 years with maximum incidence between 40 and 50 years. Gianninoto et al<sup>3</sup> performed diagnostic HYS in 512 women with complaints of AUB, age ranging from 38 to 80 years, and commonest incidence was between 30 and 45 years. In the study by Panda et al,<sup>4</sup> maximum age

incidence was found between 35 and 45 years, which is in agreement with the present study.<sup>10</sup> Similarly, van Trotsenburg et al<sup>5</sup> reported maximum age incidence between 41 and 50 years, nearly the same age range as the present study.

In the present study, most of the women (40%) were of chronic AUB, with complaints for more than 1 year, showing uterine bleeding is still neglected in our country. Singh et al<sup>6</sup> observed most of the women (34%) presented within 6 months of the onset of symptoms. Guin et al<sup>7</sup> observed 46% women presented within 7 to 12 months of excessive bleeding. Patil et al<sup>8</sup> observed 55% of women had AUB for more than 3 months to 1 year. This difference from previous studies was observed mainly because the study was carried out at a tertiary care center covering peripheral villages and tribal population, hence the ignorance on the part of patient to seek medical advice. There were many women who had failed on conservative management, or have taken treatment from various private centers and due to nonaffordability were referred to the present institution for further management.

In the present study, menorrhagia was the commonest presentation, which correlates with studies by Emanuel et al<sup>9</sup> and Guin et al.<sup>7</sup> In our study, anemia was present in all the women, 50% of them were severely anemic, like the study conducted by Sabherwal and Bhasin<sup>10</sup> (65%) and Sheth et al<sup>11</sup> (73%).

Transvaginal sonography is proposed as primary screening tool for AUB; it not only defines endometrium and uterine cavity lesions but also myometrial and adnexal abnormalities. In the present study, TVS detected six cases of simple ovarian cysts. All cases of adenomyosis were accurately diagnosed on sonography. On correlation of TVS findings with final diagnosis, it was noted that TVS had a fair agreement with final diagnosis. Transvaginal sonography has limitations in detecting small focal lesions, especially the ones iso-echoic with endometrium. Transvaginal sonography picked only 12 cases of submucous fibroid, out of these 7 cases were confirmed by HYS and final tissue diagnosis. Out of rest 5 cases of submucous fibroid detected

by TVS, 2 cases were of endometrial polyp, 2 cases of functional endometrium, and 1 case of hyperplasia confirmed by final diagnosis. Transvaginal sonography also missed 7 cases of endometrial polyp. Farquhar et al<sup>12</sup> in their systematic review reported the sensitivity of TVS in detection of submucous fibroid to range from 21 to 100% and specificity from 53 to 100% in different studies. Sensitivity and specificity of TVS for submucous fibroid in the present study is 50 and 89% respectively. Similarly, for hyperplasia TVS had sensitivity ranging between 33 and 100% and specificity between 79 and 99% in the same review.<sup>12</sup> Sensitivity and specificity of TVS for diagnosing hyperplasia in the present study is 64.7 and 67.4% respectively. To evaluate the accuracy of TVS for diagnosing adenomyosis, Bazot et al<sup>13</sup> studied TVS findings in 129 women scheduled for hysterectomy and found that the sensitivity and specificity of TVS, 100 and 83.3% respectively, and the accuracy of TVS was 91.3%; it is comparable with findings of the present study, sensitivity and diagnostic accuracy of 100%.

In the present study, endometrial polyps was the most common lesion detected on HYS of 15 (25%) women, and the findings are agreeable with Svirsky et al<sup>14</sup> and Ceci et al<sup>15</sup> with incidence on HYS of 23 and 29.7% respectively. In the systematic review by Farquhar et al,<sup>12</sup> HYS had a sensitivity ranging from 53 to 100% and specificity between 97 and 100% in detection of submucous fibroid. Pasqualotto et al<sup>16</sup> had reported sensitivity of HYS for detection of endometrial polyp as 99%. Singh et al<sup>6</sup> and Patil et al<sup>8</sup> found sensitivity and specificity of HYS in detecting endometrial polyp and submucous fibroid 100% each, which is in agreement with our study. Singh et al<sup>6</sup> compared hysteroscopic findings with histopathology findings obtained from hysterectomy and curettage and obtained 100% diagnostic accuracy for atrophic endometrium, which is comparable to current study, and the diagnostic accuracy of HYS in diagnosing atrophic endometrium was 100%. Hysteroscopy lacked sensitivity in detection of adenomyosis, which was picked accurately by TVS.

Saadia et al<sup>17</sup> compared the findings of endometrial curettage with histopathology of hysterectomy specimens and found low sensitivity of 66%, negative predictive value (NPV) of 89%, and diagnostic accuracy (DA) of 86% for endometrial polyp. This agreed with the present study as sensitivity of curettage for endometrial polyp was 40%, NPV of 83%, and DA 85% respectively. Similarly for endometrial hyperplasia, Saadia et al<sup>17</sup> found curettage was 85.7% sensitive, with NPV of 93.3% and diagnostic accuracy of 85%, which is comparable to the current study (sensitivity 94.1%, NPV of 97.7%, and DA of 98.3%).

In Aslam et al<sup>18</sup> study on comparing the TVS with final histopathologic findings, TVS had sensitivity of 71.4%,

specificity of 67.7% to detect intrauterine pathologies in AUB, which is comparable to the current study (sensitivity 79%, specificity 71.4%).

Ceci et al<sup>15</sup> compared hysteroscopic findings with histologic diagnosis via the hysterectomy specimens in women of AUB and showed a diagnostic sensitivity of 98%, a specificity of 95%, a PPV of 96%, and a NPV of 98% for diagnosing intrauterine pathologies. Their findings are comparable to the present study with sensitivity, specificity, PPV, NPV, DA of 90.5, 85.7, 97.9, 54.5, 90% respectively.

In the present study, D&C detected intrauterine pathology in 52% women, sensitivity, specificity, PPV, NPV, DA of D&C compared with final diagnosis is 58, 100, 100, 24, 63%, which is comparable to Bettocchi et al.<sup>19</sup> In their study they compared preoperative D&C histopathology reports with posthysterectomy histopathology reports and obtained sensitivity, specificity, PPV of 46, 100, 100%, and the NPV of 7.1%.

On final correlation, both endometrial biopsy and transvaginal ultrasound have poor sensitivity in the detection of intrauterine focal pathology. But adnexal lesions cannot be detected by HYS. Although HYS and sonography had fair agreement, both had complementary role and help in taking management decisions. Transvaginal sonography being sensitive, noninvasive, safe, and cost-effective should be used for initial assessment of abnormal bleeding and selection of cases for formal evaluation by HYS. Wherever possible HYS with directed biopsy should be employed in evaluation of AUB.

## CONCLUSION

Both TVS and HYS can detect intrauterine abnormalities with varying accuracies. But HYS has an edge over TVS, as it provides an "eye inside the uterus" and biopsy can be taken from the area in question. So for diagnosing intrauterine lesions (submucous fibroid, endometrial polyp, and atrophic endometrium), HYS is a better modality with high sensitivity and specificity. Transvaginal sonography is a good choice for diagnosing adenomyosis, intramural, and adenexal lesions. During evaluation of the patient with AUB, we cannot completely bypass sonography. However, the use of office hysteroscope in OPD along with clinical examination can eliminate the need of USG in many patients. Both the modalities are complementary to each other.

## LIMITATIONS

Clinical findings of patients should have been considered in the study. Further studies are needed in the area comparing efficacy of combined clinical examination and office hysteroscope findings with TVS.

## REFERENCES

1. WHO. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System (WHO/NMH/NHD/MNM/11.1). Geneva: World Health Organization; 2011.
2. Tahir MM, Bigrigg MA, Browning JJ, Brookes ST, Smith PA. A randomised controlled trial comparing transvaginal ultrasound, outpatient hysteroscopy and endometrial biopsy with inpatient hysteroscopy and curettage. *Br J Obstet Gynaecol* 1999 Dec;106(12):1259-1264.
3. Gianninoto A, Morana C, Campione C. Diagnostic hysteroscopy in abnormal uterine bleeding, five years experience. *Minerva Gynaecol* 2003 Feb;55(1):57-61.
4. Panda A, Parulekar SV, Gupta A. Diagnostic hysteroscopy in abnormal uterine bleeding and histopathological correlation. *J Obstet Gynaecol India* 1999;49:74-76.
5. van Trotsenburg M, Wieser F, Nagele F. Diagnostic hysteroscopy for the investigation of abnormal uterine bleeding in premenopausal women. *Contrib Gynecol Obstet* 2000;20: 21-26.
6. Singh S, Taneja BK, Singh P, Ahlawat R. Role of diagnostic hysteroscopy in abnormal uterine bleeding. *Int J Reprod Contracept Obstet Gynecol* 2014;3:544-551.
7. Guin G, Sandhu SK, Lele A, Khare S. Hysteroscopy in evaluation of abnormal uterine bleeding. *J Obstet Gynaecol India* 2011 Oct;61(5):546-549.
8. Patil SG, Bhute SB, Inamdar SA, Acharya NS, Shrivastava DS. Role of diagnostic hysteroscopy in abnormal uterine bleeding and its histopathologic correlation. *J Gynaecol Endosc Surg* 2009 Jul;1(2):98-104.
9. Emanuel MH, Verdel MJ, Wamsteker K, Lamemes FB. A prospective comparison of TVS and diagnostics hysteroscopy in the evaluation of women with abnormal uterine bleeding: clinical implications. *Am J Obstet Gynaecol* 1995 Feb;172(2 Pt 1):547-552.
10. Sabherwal G, Bhasin S. Role of transvaginal sonography, diagnostic hysteroscopy and dilatation and curettage on cases of menorrhagia in the perimenopausal age group. *J Obstet Gynecol India* 2002;55(3):106-108.
11. Sheth SS, Nehrukar NM, Mangeskar P. Hysteroscopy in abnormal bleeding. *J Obstet Gynecol India* 1990;40(3): 451-454.
12. Farquhar C, Ekeroma A, Furness S, Arroll B. A systematic review of transvaginal ultrasonography, sonohysterography and hysteroscopy for the investigation of abnormal uterine bleeding in premenopausal women. *Acta Obstet Gynecol Scand* 2003 Jun;82(6):493-504.
13. Bazot M, Darai E, Rouger J, Detchev R, Cortez A, Uzan S. Limitations of transvaginal sonography for the diagnosis of adenomyosis, with histopathological correlation. *Ultrasound Obstet Gynecol* 2002 Dec;20(6):605-611.
14. Svirsky R, Smorgick N, Rozowski U, Sagiv R, Feingold M, Halperin R, Pansky M. Can we rely on blind endometrial biopsy for detection of focal intrauterine pathology? *Am J Obstet Gynecol* 2008 Aug;199(2):115.e1-115.e3.
15. Ceci O, Bettocchi S, Pellegrino A, Impedovo L, Di Venere R, Pansini N. Comparison of hysteroscopic and hysterectomy findings for assessing the diagnostic accuracy of office hysteroscopy. *Fertil Steril* 2002 Sep;78(3):628-631.
16. Pasqualotto EB, Margossian H, Price LL, Bradley LD. Accuracy of preoperative diagnostic tools and outcomes of hysteroscopic management of menstrual dysfunction. *J Am Assoc Gynecol Laparosc* 2000 May;7(2):201-209.
17. Saadia A, Mubarak A, Zubair A, Jamal S, Zafar A. Diagnostic accuracy of endometrial curettage in endometrial pathology. *J Ayub Med Coll Abbottabad* 2011 Jan-Mar;23(1):129-131.
18. Aslam M, Ijaz L, Tariq S, Shafqat K, Meher-Un-Nisa, Ashraf R, Kazmi T. Comparison of transvaginal sonography and saline contrast sonohysterography in women with abnormal uterine bleeding: correlation with hysteroscopy and histopathology. *Int J Health Sci (Quassim)* 2007 Jan;1(1):17-24.
19. Bettocchi S, Ceci O, Vicino M, Mareello F, Impedovo L, Selvaggi L. Diagnostic inadequacy of dilatation and curettage. *Fertil Steril* 2001 Apr;75(4):803-805.