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Original Research Article

Diagnostic comparison of ultrasonography, hysteroscopy and histopathology in abnormal uterine bleeding

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ABSTRACT

Background: The objective of the study was to do diagnostic comparison of ultrasonography, hysteroscopy and histopathological examination in evaluation of abnormal uterine bleeding.
Methods: An observational prospective study is conducted amongst 219 married women between age of 25 years to 59 years with Abnormal uterine bleeding admitted for diagnostic hysteroscopy at Obstetrics and Gynecology Department, Apollo Hospital, Bilaspur, Chhattisgarh from November 2022 to October 2023. Statistical analysis was assessed by chi square test.
Results: Myoma is best diagnosed by Sonography. The exact size, shape, type of fibroid and location can be accurately diagnosed by USG. Endometrial hyperplasia, endometrial polyp, submucous fibroid, growth, septum, flimsy adhesions, focal lesions and intracavitary intrauterine lesions are best diagnosed by hysteroscopy. Endometrial carcinoma is best diagnosed by histopathology.
Conclusions: Hysteroscopy has important role in diagnosis of intrauterine and endocervical canal abnormalities. Addition of hysteroscopy with histopathological examination of endometrial and cervical biopsy sample along with transvaginal ultrasonography enhances the accuracy of diagnosis. Use of hysteroscopy, ultrasonography and histopathology were not competitive rather complementary for diagnosing patients with abnormal uterine bleeding. Diagnostic tools like ultrasonography, hysteroscopy and histopathology helps in accurate, early diagnosis of endometrial and cervical cancer which prevents further damage and further spread and metastasis of disease to adjacent tissues/ organs. Early diagnosis and cure increases life expectancy and decreases morbidity and mortalityd.

Keywords: Abnormal uterine bleeding, Diagnostic accuracy, Hysteroscopy, Ultrasonography

INTRODUCTION

Diagnostic hysteroscopy is now considered as gold standard for evaluation of uterine cavity. It is accurate and less invasive method for the evaluation of common gynecological disorders such as abnormal uterine bleeding, endometrial hyperplasia, endometrial cancer etc. It helps in direct visualization of the endometrial cavity, directed biopsy and sampling of suspected lesions with great safety.[1]

Ultrasonography is the gold standard as it is simple, safe, non-invasive, cost effective and reliable method in diagnosis of gynecological diseases like endometrial polyp, endometrial hyperplasia, uterine fibroid, submucous myoma, adenomyosis, endometriosis, leiomyoma.[2]

Histopathology refers to the microscopic examination of tissue/biopsy or surgical specimen by a pathologist after the specimen has been processed and histological sections have been placed onto glass slides. Endometrial biopsy is

the gold standard method for distinguishing normal endometrium from pathological endometrium.[3]

Federation of International Gynecology and Obstetrics (FIGO) have approved a classification system for abnormal uterine bleeding. It classifies the causes into two categories structural and functional. It is described by the acronym PALM-COEIN. PALM (structural): P- Polyp, A-Adenomyosis, L-Leiomyoma, M-Malignancy. COEIN (functional)): C-Coagulopathies, O-Ovulatory dysfunction, E-Endometrial, I-Iatrogenic, N-Not yet classified.[4]

The objective of the study was to do diagnostic comparison of ultrasonography, hysteroscopy and histopathological examination in evaluation of abnormal uterine bleeding.

METHODS

Study design

This was a prospective, observational study. Relevant history taken and clinical examination was conducted in all women. Transvaginal sonography was done along with the routine pre operative investigations. Hysteroscopy was performed under general anesthesia. Distension of uterine cavity was by normal saline with inflow pressure of 120 mm of Hg. Hysteroscope after entering uterine cavity, both the tubal ostia visualized followed by inspecting all the four intrauterine walls and findings were recorded. After removing hysteroscope, endometrial sample was collected by gentle curettage for histopathological diagnosis. Cervical biopsy done. The correlation between findings of ultrasonography, hysteroscopy and histopathology was tabulated.

Study site

This study conducted at Obstetrics and Gynecology Department, Apollo Hospital, Bilaspur, Chhattisgarh.

Study population

Married women between age of 25 years to 59 years with Abnormal uterine bleeding admitted for diagnostic hysteroscopy were included.

Duration of study

This study was conducted from November 2022 to October 2023.

Inclusion criteria

Married women of between age of 25 years to 59 years admitted for diagnostic hysteroscopy with chief complaints of heavy or irregular menses, intermenstrual bleeding, vaginal bleeding after intercourse, postmenopausal bleeding included in the study from the period of November 2022 to October 2023. Women with normal or slightly bulky size uterus on bimanual examination and/or also by transvaginal sonography were included. Per vaginal and per speculum examination was done in all women.

Exclusion criteria

Women with menstrual complaints such as oligomenorrhea and hypomenorrhea; women having suspected pregnancy or pre-existing thyroid dysfunction and/or coagulopathy revealed in pre-operative investigations were excluded from this study.

Sample size calculation

Sample size is calculated by using convenience sampling technique.

Formula used $n = \frac{z^2 \times p \times q}{e^2}$

n= Minimum required sample size, z= 1.96 at 95% confidence interval, p= prevalence, prevalence of abnormal uterine bleeding in India is 17% according to study conducted by Vaidya et al, q= 1-p, and e= margin of error that is 5%.[17]

$$\frac{(1.96)^2 \times 0.17 \times 0.83}{(0.05)^2}$$

= 216 cases approximately

Total 219 cases were included in this study.

Statistical analysis

All the data was noted down in a pre-designed study proforma. Association between qualitative variables was assessed by Chi-Square test. A p value <0.05 was taken as level of significance. Results were graphically represented where deemed necessary. Microsoft Excel 2010 for graphical representation. Sensitivity, Specificity, positive predictive value, negative predictive value and diagnostic accuracy calculated.

RESULTS

In hysteroscopy in present study, endometrial hyperplasia and thickened endometrium is found in 26% cases, endometrial polyp is found in 32.42% cases, thickened endometrium with endometrial polyp is found in 11.41% cases, myoma is found in 8.67% cases, endometrial carcinoma is predicted in 0.45% cases, adenomyosis in 1.36% cases and myoma with endometrial polyp in 1.82% cases. In histopathological findings in present study, the percentage of endometrial hyperplasia (4.10%), disordered proliferative endometrium (18.26%), submucous myoma (0.01%), endometrial carcinoma (1.36%). In ultrasonography in present study, endometrial hyperplasia is seen in 10.50% cases, endometrial polyp is found in 6.14% cases, thickened endometrium is found in 21%

cases, myoma is found in 36.52% cases, endometrial carcinoma is predicted in 0.45% cases, adenomyosis in 8.67% cases (Table 1).

USG findings Vs hysteroscopic findings: Myoma is diagnosed in 36.52% cases in USG compared to 8.67% cases on hysteroscopy. Endometrial hyperplasia is diagnosed in 10.5% cases in USG and in 26% cases in hysteroscopy. Endometrial polyp is diagnosed in 6.14% cases in USG and in 32.42% cases in hysteroscopy. Endometrial carcinoma is diagnosed in 0.45% cases in USG and in 0.45% cases in hysteroscopy (Table 1).

Hysteroscopy Vs histopathological findings: Myoma is diagnosed in 0.01% cases in HPE compared to 8.67% cases in hysteroscopy. Endometrial hyperplasia is diagnosed in 4.10% cases in HPE and in 26% cases in hysteroscopy. Endometrial polyp is diagnosed in 13.69% cases in HPE and in 32.42% cases in hysteroscopy. Endometrial carcinoma is diagnosed in 1.36% cases in HPE and in 0.45% cases in hysteroscopy (Table 1).

USG findings Vs histopathological findings: Myoma is diagnosed in 36.52% cases in USG compared to 0.01% cases in HPE. Endometrial hyperplasia is diagnosed in 10.5% cases in USG and in 4.10% cases in HPE. Endometrial polyp is diagnosed in 6.14% cases in USG and in 13.69% cases in HPE. Endometrial carcinoma is diagnosed in 0.45% cases in USG and in 1.36% cases in HPE (Table 1).

Table 1: Comparison of ultrasonographic, hysteroscopic and histopathological findings in abnormal uterine bleeding.

	Number of patients	Percentage	HPE findings	Number of patients	Percentage
USG findings					
Myoma	80	36.52	Myoma	01	0.01
Hyperplasia	23	10.50	Hyperplasia	49	22.37
Endometrial carcinoma	01	0.45	Endometrial carcinoma	03	1.36
Endometrial polyp	15	6.14	Endometrial polyp	32	14.61
Normal	52	23.74	Normal	137	62.55
Hysteroscopic findings in co-relation to histopathological findings					
Myoma	19	8.67	Myoma	01	0.01
Hyperplasia	57	26	Hyperplasia	49	22.37
Endometrial carcinoma	01	0.45	Endometrial carcinoma	03	1.36
Endometrial polyp	71	32.42	Endometrial polyp	32	14.61
Thin/atrophic endometrium	23	10.5	Thin/atrophic endometrium	05	2.28
Normal	62	28.31	Normal	137	62.55
Ultrasonographic findings in co-relation to hysteroscopic findings					
Myoma	80	36.52	Myoma	19	8.67
Hyperplasia	23	10.50	Hyperplasia	57	26
Endometrial carcinoma	01	0.45	Endometrial carcinoma	01	0.45
Endometrial polyp	15	6.14	Endometrial polyp	71	32.42
Normal	52	23.74	Normal	62	28.31

According to sonographic findings in present study in all age groups, myoma is the most common cause of AUB, 2nd most common cause is endometrial hyperplasia and thickened endometrium, 3rd common cause endometrial polyp and 4th cause is adenomyosis (Figure 1).

Chi square p value for histopathological findings myoma, endometrial polyp, endometrial hyperplasia and endometrial carcinoma is 0, 0.6384, 0.0062 and 0.2351 respectively. Chi square p value for ultrasonographic findings myoma, endometrial polyp, endometrial hyperplasia and endometrial carcinoma is 0.0339, 0.3532, 1.35 and 0.225 respectively. Chi square p value for hysteroscopic findings myoma, endometrial polyp, endometrial hyperplasia and endometrial carcinoma is 0.1221, 0.1762, 0, 0.225 respectively (Table 2).

The incidence of myoma, endometrial hyperplasia, thickened endometrium, adenomyosis, bulky uterus and endometrial polyp is highest in perimenopausal age group 41- 50 years in ultrasonography. According to sonographic findings in present study, myoma is the most common cause of Abnormal uterine bleeding in perimenopausal 41-50 years age group. 2nd most common cause of AUB is endometrial hyperplasia and thickened endometrium, 3rd common cause of AUB is adenomyosis and 4th common cause of AUB is endometrial polyp in perimenopausal age group 41-50 years in sonography (Figure 2).

Table 2: Chi square p value for ultrasonographic findings, hysteroscopic findings and histopathological findings in abnormal uterine bleeding.

	Observed value (%)	Expected value (%)	Chi square P value
USG findings			
Myoma	36.52	37.65	0.0339
Endometrial polyp	6.14	7.8	0.3532
Endometrial hyperplasia	10.5	15	1.35
Endometrial carcinoma	0.45	0.9	0.225
Hysteroscopic findings			
Myoma	8.67	7.7	0.1221
Endometrial polyp	32.42	34.9	0.1762
Endometrial hyperplasia	26	26	0
Endometrial carcinoma	0.45	0.9	0.225
Histopathological findings			
Myoma	0.01	0	0
Endometrial polyp	14.61	18	0.6384
Endometrial hyperplasia	22.37	22	0.0062
Endometrial carcinoma	1.36	0.9	0.2351

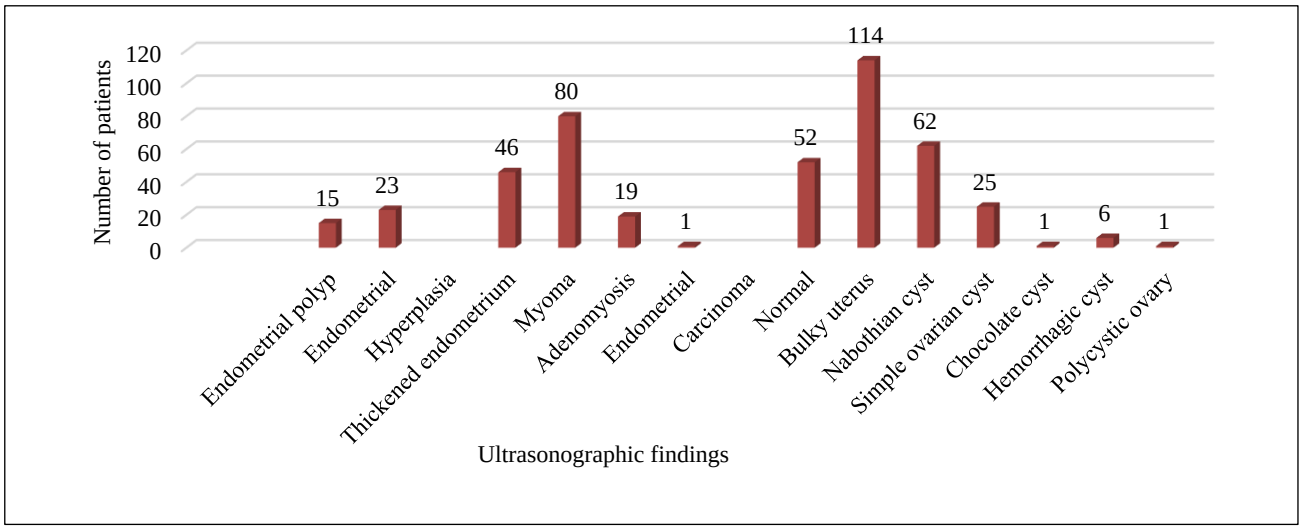

Figure 1: Ultrasonographic findings in women with abnormal uterine bleeding.

Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of hysteroscopy in diagnosing all types of myoma is 23.75%, 100%, 100%, 69.5% and 72.14% respectively. Sensitivity, Specificity, positive predictive value, negative predictive value, and diagnostic accuracy of hysteroscopy in diagnosing endometrial hyperplasia is 100%, 82.65%, 40.35%, 100% and 84.47% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of hysteroscopy in diagnosing endometrial polyp is 100%, 79.14%, 45.07%, 100% and 82.19% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of hysteroscopy in diagnosing endometrial carcinoma is 33.33%, 100%, 100%, 99.08% and 99.08% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of ultrasonography in diagnosing myoma is 100%, 69.5%, 23.75%, 100% and 72.14% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of ultrasonography in diagnosing endometrial Hyperplasia is 40.35%, 100%, 100%, 82.65% and 84.47% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of ultrasonography in diagnosing endometrial polyp is 21.12 %, 100%, 100%, 72.54% and 74.42% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of ultrasonography in diagnosing endometrial carcinoma is 33.33%, 100%, 100%, 99.08% and 99.08% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of histopathology in diagnosing submucous myoma is 100%, 100%, 100%, 100% and 100% respectively. Sensitivity,

specificity, positive predictive value, negative predictive value, and diagnostic accuracy of histopathology in diagnosing endometrial polyp is 45.07 %, 100%, 100%, 79.14 % and 82.19 % respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of histopathology in diagnosing endometrial hyperplasia is 100 %, 77.14%, 15.78%, 100 % and 78.08% respectively. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of histopathology in diagnosing endometrial carcinoma is 100 %, 99.08%, 33.33%, 100 % and 99.08 % respectively (Table 3).

According to hysteroscopic findings in present study in all age groups the most common cause of AUB is endometrial polyp, 2nd most common cause is endometrial hyperplasia and the 3rd common cause of AUB is myoma (Figure 3).

According to hysteroscopic findings in present study, endometrial polyp is the most common cause of abnormal uterine bleeding in perimenopausal age group 41-50 years, Endometrial hyperplasia with thickened and irregular endometrium is the 2nd most common cause and Myoma is the 3rd most common cause of AUB in perimenopausal age group on hysteroscopic findings (Figure 4).

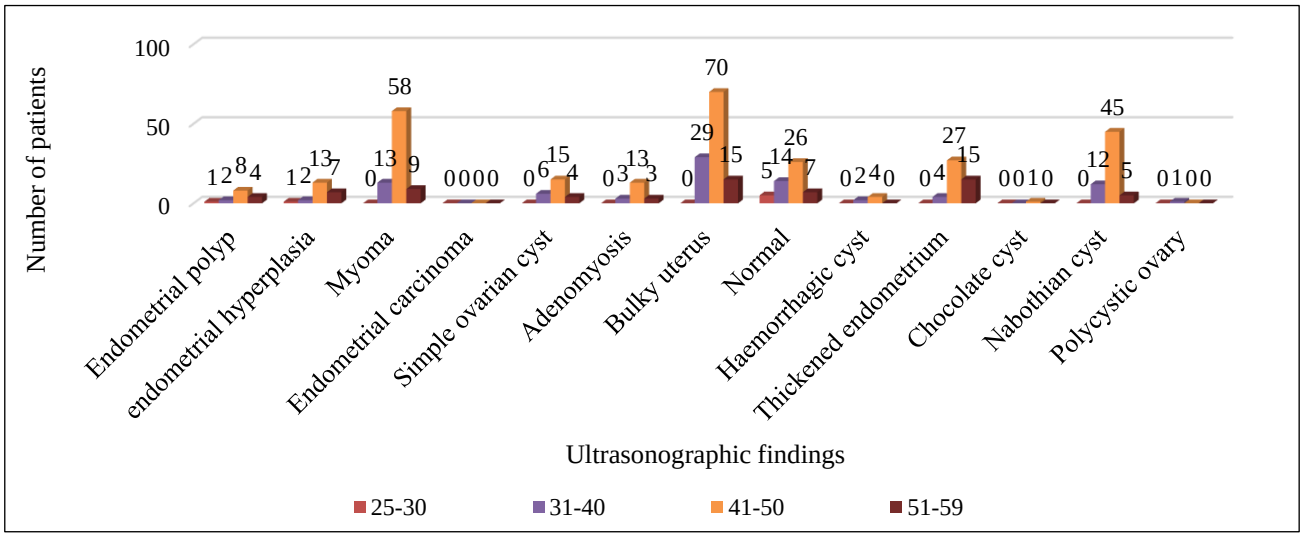

Figure 2: Age group wise distribution of ultrasonographic findings in abnormal uterine bleeding.

Table 3: Correlation of hysteroscopy, ultrasonography and histopathology in abnormal uterine bleeding.

Correlation of hysteroscopy, ultrasonography and histopathology in abnormal uterine bleeding			
Correlation of hysteroscopy with ultrasonography for diagnosing myoma			
Hysteroscopy	Ultrasonography myoma present	Ultrasonography myoma absent	Total
Myoma present	19 [True positive]	0 [False positive]	19
Myoma absent	61 [False negative]	139 [True negative]	200
	80	139	219
Correlation of histopathology with hysteroscopy for diagnosing submucous myoma			
Histopathology	Hysteroscopy submucous myoma present	Hysteroscopy submucous myoma absent	Total
Submucous myoma present	01 [True positive]	0 [False positive]	01
Submucous myoma absent	0 [False negative]	218 [True negative]	218
	01	218	219
Correlation of hysteroscopy with ultrasonography for diagnosing endometrial hyperplasia			
Hysteroscopy	Ultrasonography endometrial hyperplasia present	Ultrasonography endometrial hyperplasia absent	Total
Endometrial hyperplasia present	23 [True positive]	34 [False positive]	57
Endometrial hyperplasia absent	0 [False negative]	162 [True negative]	162
	23	196	219
Correlation of ultrasonography with hysteroscopy for diagnosing endometrial hyperplasia			
Ultrasonography	Hysteroscopy endometrial hyperplasia present	Hysteroscopy endometrial hyperplasia absent	Total

Continued.

Correlation of hysteroscopy, ultrasonography and histopathology in abnormal uterine bleeding			
Endometrial hyperplasia present	23 [True positive]	0 [False positive]	23
Endometrial hyperplasia absent	34 [False negative]	162 [True negative]	196
	57	162	219
Correlation of histopathology with hysteroscopy for diagnosing endometrial hyperplasia			
Histopathology	Hysteroscopy endometrial hyperplasia present	Hysteroscopy endometrial hyperplasia absent	Total
Endometrial hyperplasia present	09 [True positive]	48 [False positive]	57
Endometrial hyperplasia absent	0 [False negative]	162 [True negative]	162
	09	210	219
Correlation of hysteroscopy with histopathology for diagnosing endometrial polyp			
Hysteroscopy	Histopathology endometrial polyp present	Histopathology endometrial polyp absent	Total
Endometrial polyp present	32 [True positive]	39 [False positive]	71
Endometrial polyp absent	0 [False negative]	148 [True negative]	148
	32	187	219
Correlation of ultrasonography with hysteroscopy for diagnosing endometrial polyp			
Ultrasonography	Hysteroscopy endometrial polyp present	Hysteroscopy endometrial polyp absent	Total
Endometrial polyp present	15 [True positive]	0 [False positive]	15
Endometrial polyp absent	56 [False negative]	148 [True negative]	204
	71	148	219
Correlation of histopathology with hysteroscopy for diagnosing endometrial polyp			
Histopathology	Hysteroscopy endometrial polyp present	Hysteroscopy endometrial polyp absent	Total
Endometrial polyp present	32 [True positive]	0 [False positive]	32
Endometrial polyp absent	39 [False negative]	148 [True negative]	187
	71	148	219
Correlation of hysteroscopy with histopathology for diagnosing endometrial carcinoma			
Hysteroscopy	Histopathology endometrial carcinoma present	Histopathology endometrial carcinoma absent	Total
Endometrial carcinoma present	01 [True positive]	0 [False positive]	01
Endometrial carcinoma absent	02 [False negative]	216 [True negative]	218
	03	216	219
Correlation of ultrasonography with hysteroscopy for diagnosing endometrial carcinoma			
Ultrasonography	Hysteroscopy myoma present	Hysteroscopy myoma absent	Total
Myoma present	19 [True positive]	61 [False positive]	80
Myoma absent	0 [False negative]	139 [True negative]	139
	19	200	219
Correlation of ultrasonography with histopathology for diagnosing endometrial carcinoma			
Ultrasonography	Histopathology endometrial carcinoma present	Histopathology endometrial carcinoma absent	Total
Endometrial carcinoma present	01 [True positive]	0 [False positive]	01
Endometrial carcinoma absent	02 [False negative]	216 [True negative]	218
	03	216	219
Correlation of histopathology with hysteroscopy for diagnosing endometrial carcinoma			
Histopathology	Hysteroscopy endometrial carcinoma present	Hysteroscopy endometrial carcinoma absent	Total

Continued.

Correlation of hysteroscopy, ultrasonography and histopathology in abnormal uterine bleeding			
Endometrial carcinoma present	01 [True positive]	2 [False positive]	03
Endometrial carcinoma absent	0 [False negative]	216 [True negative]	216
	01	218	219

According to histopathological findings in present study in all age groups, the most common cause of AUB is disordered proliferative endometrium, 2nd most common cause is endometrial polyp and 3rd common cause of AUB is endometrial hyperplasia (Figure 5).

According to histopathological findings in present study, the most common cause of AUB is disordered proliferative endometrium and the 2nd most common cause is endometrial polyp in perimenopausal age group i.e. 41- 50 years age group (Figure 6).

Myoma is best diagnosed by Sonography. The exact size, shape, type of fibroid and location can be accurately diagnosed by USG. Endometrial hyperplasia, endometrial polyp, submucous fibroid, growth, septum, flimsy adhesions, focal lesions and intracavitary intrauterine lesions are best diagnosed by hysteroscopy. Endometrial carcinoma is best diagnosed by histopathology. Diagnostic accuracy of histopathology is 100% in diagnosing fibroid, adenomyosis, endometrial hyperplasia, polyp and endometrial and cervical carcinoma when complete uterus is examined following hysterectomy (Figure 7).

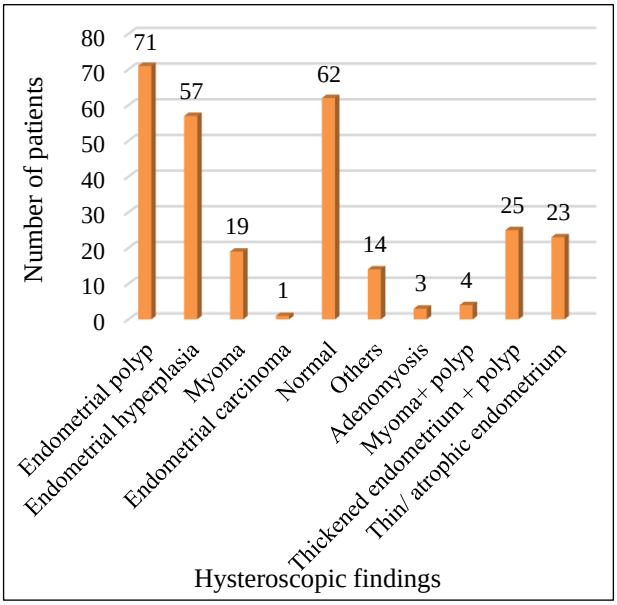

Figure 3: Hysteroscopic findings in women with abnormal uterine bleeding.

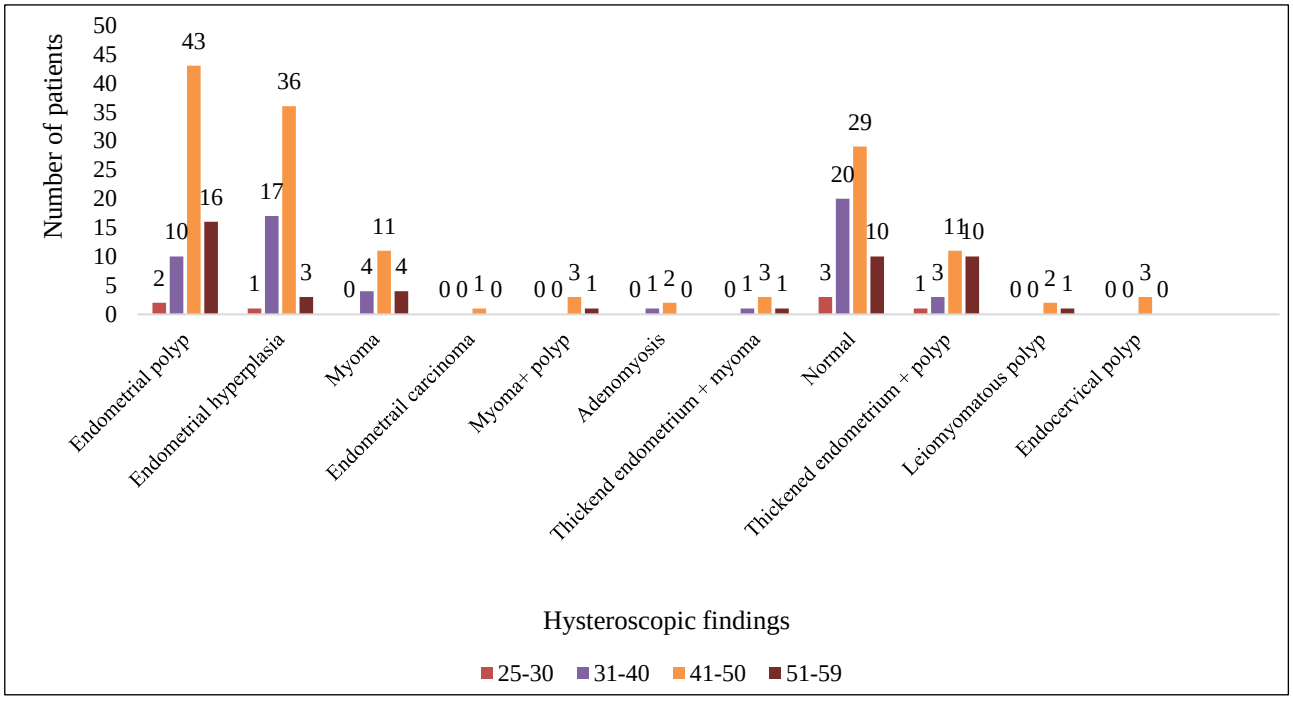

Figure 4: Age group wise distribution of hysteroscopic findings in abnormal uterine bleeding.

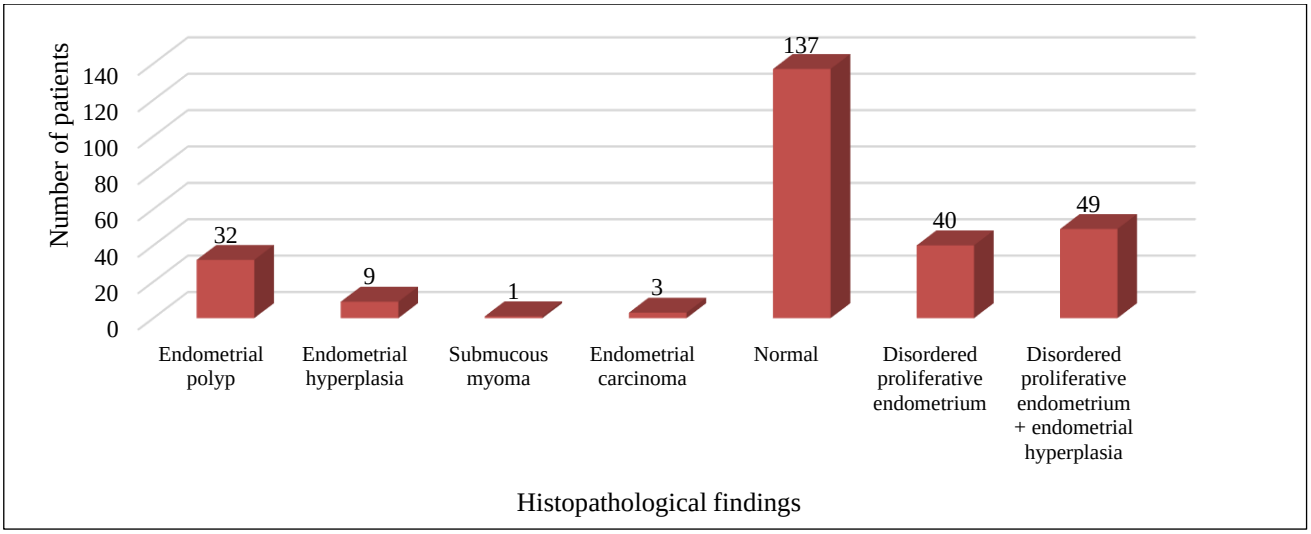

Figure 5: Histopathological findings in women with abnormal uterine bleeding.

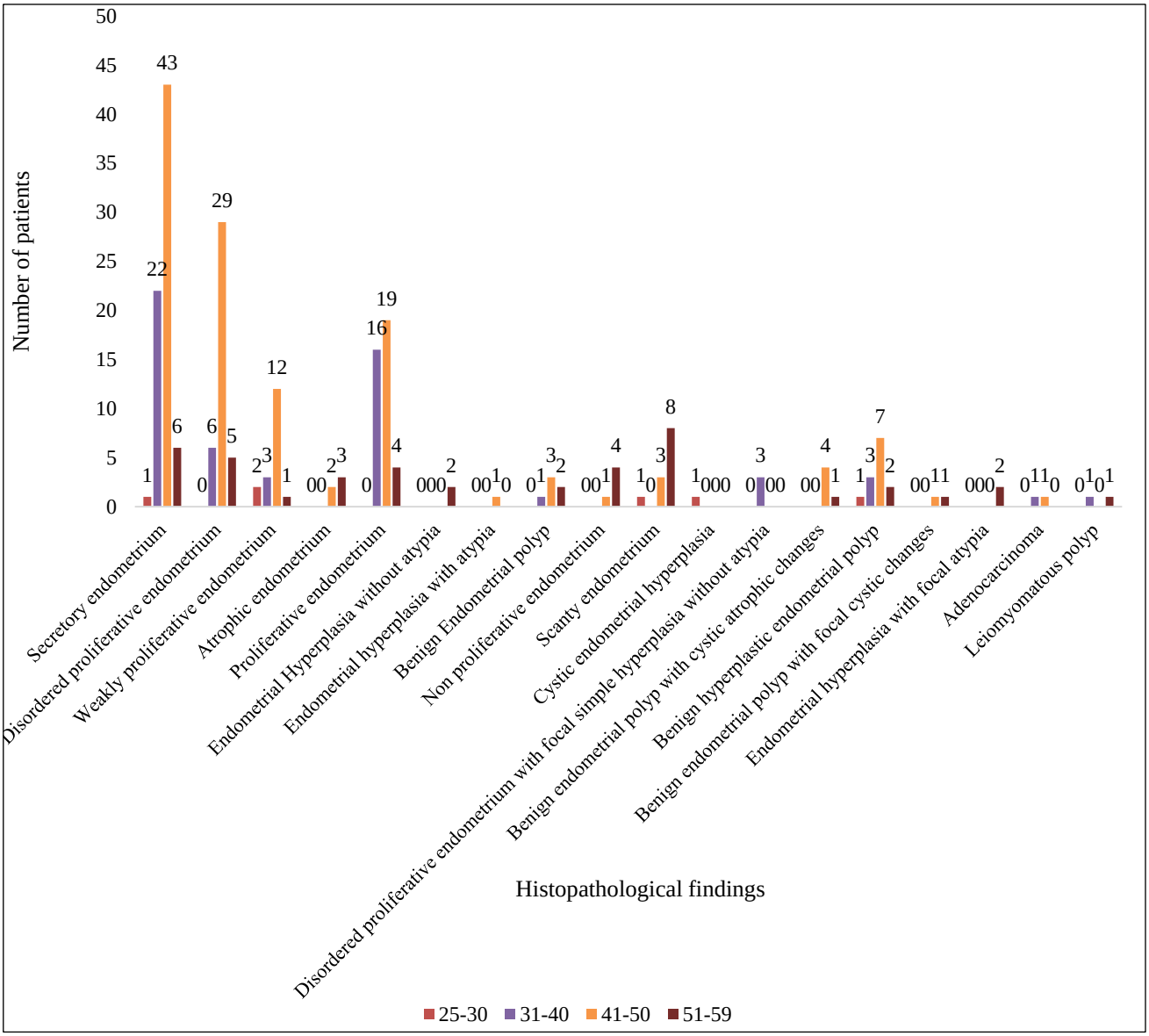

Figure 6: Age group wise histopathological findings of endometrial biopsy in abnormal uterine bleeding.

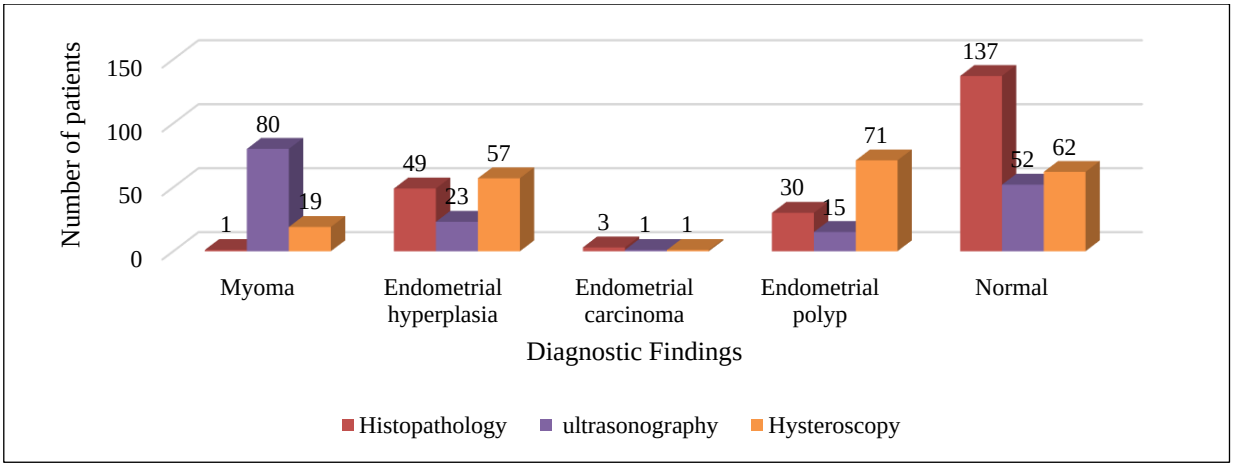

Figure 7: Diagnostic comparison of histopathology, ultrasonography, and hysteroscopy in abnormal uterine bleeding.

DISCUSSION

In present study, hysteroscopy accurately detected endometrial polyp, submucous fibroid and all cases of endometrial hyperplasia in all cases, like Kumaresan et al study.[6] According to Gita et al study polyp is seen in 28% cases, hyperplasia is seen in 30% cases and myoma is seen in 16% cases.[9] According to Nanda et al study polyp is seen in 18%cases, hyperplasia is seen in 16% cases and myoma is seen in 10% cases.[10] According to Singh S et al study polyp is seen in 8% cases, hyperplasia is seen in 26% cases and myoma is seen in 7% cases.[11] According to Valson et al study polyp is seen in 16% cases, hyperplasia is seen in 12% cases and myoma is seen in 4% cases.[5] In present study, polyp is seen in 32.42% cases, hyperplasia is seen in 26% cases and myoma is seen in 8.67% cases on hysteroscopy.

Prevalence of fibroid in India is 37.65% according to Munusamy et al.[12] In present study, 37.65% is considered as expected value of myoma in ultrasonographic finding to calculate chi square p value (p value in present study 0.0339). The prevalence of polyp ranges from 7.8 to 43.9% of women and seems to increase with age according to Clark et al study.[13] Prevalence of endometrial carcinoma is 0.9% according to GGA study.[14] In present study, 0.9% value is considered as expected value for endometrial carcinoma.

Chi square p value in USG, hysteroscopy and HPE is 0.225, 0.225 and 0.2351 respectively in present study. According to More et al study, incidence of endometrial hyperplasia in abnormal uterine bleeding to be 15% in USG.[16] It is considered as expected value in calculating chi square p value of endometrial hyperplasia in USG (p value in present study 1.35). According to Dinic et al study, myoma is seen in 7.7% cases in hysteroscopy.[8] It is considered as expected value to calculate chi square p value (p value in present study 0.1221). According to Singh et al study, hyperplasia is seen in 26% cases.[11] This 26% is considered as expected value to calculate chi square p value in present study in hysteroscopy (p value in present study 0). The prevalence of endometrial polyp is 7.85% in ultrasonography in Dreisler et al study.[15] This is considered as expected value in calculating chi square p value (p value in present study 0.3532). The percentage of submucous myoma is 0% in hysteroscopy (p value in present study is 0.1221) and the percentage of endometrial hyperplasia is 22% in histopathology in Kumaresan et al study (p value in present study 0.0062).[6] These values are considered as expected value in calculating chi square p value.

This study has few limitations. Hysteroscopy is difficult in patients with cervical stenosis, obstruction of cervical canal or uterine cavity and abnormal position of uterus, increased risk of fluid overload in patients with renal disease.

CONCLUSION

Hysteroscopy has important role in diagnosis of intrauterine and endocervical canal abnormalities. Addition of hysteroscopy with histopathological examination of endometrial and cervical biopsy sample along with transvaginal ultrasonography enhances the accuracy of diagnosis. Use of hysteroscopy, ultrasonography and histopathology were not competitive rather complementary for diagnosing patients with abnormal uterine bleeding. Diagnostic tools like ultrasonography, hysteroscopy and histopathology helps in accurate, early diagnosis of endometrial and cervical cancer which prevents further damage and further spread and metastasis of disease to adjacent tissues/organs. Early diagnosis and cure increases life expectancy and decreases morbidity and mortality.

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