ACCURACY OF TRANSVAGINAL ULTRASONOGRAPHY IN PREDICTION OF ENDOMETRIAL PATHOLOGY IN POST MENOPAUSAL WOMEN

DISSERTATION SUBMITTED FOR

M.D. DEGREE (OBSTETRICS AND GYNAECOLOGY)

BRANCH II

MARCH 2010

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI

CERTIFICATE

This is to certify that the dissertation titled ***"Accuracy of transvaginal ultrasonography in prediction of endometrial pathology in post menopausal women"*** *submitted by* ***Dr. Ramya Ponnuswamy*** *to the Faculty of Obstetrics and Gynaecology, The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the requirement for the award of M.D. Degree (Obstetrics and Gynaecology) is a bonafide research work carried out by her under my direct supervision and guidance.*

Dr. Revathy Janakiram M.D., D.G.O., M.N.A.M.S.
Director
Institute of Obstetrics and Gynaecology
Madras Medical College
Chennai - 600 007

DECLARATION

I, ***Dr. Ramya Ponnuswamy,*** *solemnly declare that the dissertation titled* ***"Accuracy of transvaginal ultrasonography in the prediction of endometrial pathology in postmenopausal women"*** *has been prepared by me.*

This is submitted to the ***Tamilnadu Dr. M.G.R. Medical University****, Chennai in partial fulfilment of the rules and regulations for the M.D. Degree Examination in Obstetrics and Gynaecology.*

Place : Chennai

Date : ***Dr.Ramya Ponnuswamy***

ACKNOWLEDGEMENT

I express my heartfelt gratitude to **Dr. Revathy Janakiram, M.D., D.G.O., MNAMS,** Director, Institute of Obstetrics and Gynaecology, Madras Medical College, Chennai for permitting me to conduct this study and for the constant support extended throughout the study.

I extend my thanks to **Dr. Shanti Dinakaran, M.D., D.G.O.**, Deputy Director, Institute of Obstetrics and Gynaecology for her guidance and support.

I am extremely thankful to my guide **Dr. K. Jayashree Srinivasan, M.D., D.G.O.**, Additional Professor, IOG for her valuable guidance and encouragement. The constant support of her made easy for me to bring out this study.

My profound thanks to **Dr. Mohana Sundaram, M.D., DNB., Ph.D.**, Dean, Madras Medical College, Chennai for providing me the opportunity and the materials needed for the study.

My grateful thanks to **Dr. K. Saraswathy, M.D., D.G.O.,** Former Director, IOG for her support and help provided to conduct this study.

My special thanks to **Dr. Mohan Ram, DMRT and Dr.Vijayalaksmi, M.D.(RT).,** of the Radiology Department and **Dr. Kanchana, M.D.(Path)**, Department of Pathology for their co-operation and help for conducting this study.

I thank all my Professors and Assistant Professors for the help extended during this study.

This study could not have been brought to paper if not for the co-operation of the patients and they are gratefully acknowledged.

Last but not the least, I must thank my family members for their untiring support and patience.

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Introduction

INTRODUCTION

Health aspects in postmenopausal women have gained importance in recent years owing to the increased life expectancy. According to WHO, the disability adjusted life expectancy (DALE) exceeds 70 yrs in about 24 countries, with women living longer than men by an average of 7 to 8 years (1). The average age at menopause ranges from 45 yrs in the Indian woman to 51 years in the Western population depending on the hereditary, life style and nutritional factors (2, 3, 4).Thus a woman spends more than two to three decades of life in her menopause.

The principal gynecological cancers (breast, ovary, uterus, and cervix) account for over 40% of cancers found in women worldwide. However, large differences exist, in both their incidence and geographical distribution. Endometrial cancer is currently the most common gynecological malignancy in developed countries (5). A number of reports have suggested that the incidence of carcinoma of the endometrium is increasing in the United States and other industrialised countries (6, 7). The incidence of endometrial cancer is 3.7% to 17.9% in postmenopausal women with abnormal uterine bleeding (8, 9). The incidence of endometrial cancer in asymptomatic women was 0.13% and atypia was seen in 0.63% (10).

Endometrial carcinoma fortunately when detected early can be cured with less morbidity and mortality. It has much higher cure rates if diagnosed early.

Localised disease(stage I and II) has a 5 year survival of 87% and 76% respectively, but much poorer for stage III with 5 yr survival rate of <60% (11).Endometrial polyps often have hyperplastic changes and the risk of premalignant to malignant polyp increases with age, menopausal status and hypertension (12). In contrast to cervical cancer, there are no routine mass screening programmes for the early detection of endometrial abnormalities.

Tradionally dilatation and curettage has been used for endometrial sampling. Dilation and curettage is invasive, and is associated with a 1–2% complication rate, thus less invasive endometrial biopsy techniques are increasingly favoured for evaluating these women (13). Although many safe techniques are now available for detecting and diagnosing neoplastic lesions of the endometrium, these methods are invasive (14, 15). It might be preferable to first use some noninvasive method, such as ultrasound, to identify women at risk who should undergo endometrial biopsy.

Transabdominal sonography can be used to detect many forms of endometrial pathology including cancer. Transvaginal sonography yields even more detailed images of the uterus (16, 17). It facilitates the measurement of endometrial thickness and morphology with good patient acceptance. Transvaginal sonography measurement of endometrial thickness and morphology has been demonstrated to have high accuracy in excluding endometrial polyps, hyperplasia and cancer in women with post menopausal bleeding (18).It is minimally invasive and has high cancer detection rates (19,20). In populations with 31% or less

combined prevalence of endometrial carcinoma or atypical adenomatous hyperplasia, algorithms utilizing transvaginal sonography as the initial test are most cost effective when compared to biopsy-based algorithms in evaluating perimenopausal and postmenopausal women with abnormal vaginal bleeding (21). The society of Radiologists in Ultrasound sponsored Consensus Conference statement state that in the evaluation of women with PMB either transvaginal sonography or endometrial biopsy could be used safely and effectively as the first diagnostic step (23).

Review of literature

REVIEW OF LITERATURE

Menopause is the permanent cessation of menstruation. It is defined retrospectively as the time of the final menstrual period followed by 12 months of amenorrhea. Post menopause describes the period following the final menses (3). Postmenopausal bleeding describes the occurrence of vaginal bleeding following a woman's last menstrual cycle irrespective of the quantity of bleeding. Vaginal bleeding that occurs after 6 months of amenorrhea from presumed menopause should be considered abnormal (24).

Post menopausal bleeding is a serious complaint. It is the most common clinical symptom of endometrial carcinoma. About 10 to 20% of all women with postmenopausal bleeding are diagnosed with endometrial carcinoma and hence all women require investigation to exclude malignancy (26).

Causes of postmenopausal bleeding

[Weiderpass et al (25)]

Normal or atrophic	58.8%
Endometrial carcinoma	9.4%
Endometrial polyp	9.4%
Carcinoma of cervix	6%
Submucous fibroid	4%
Endometrial hyperplasia, pyometra, ovarian cancer, urethral caruncle	12.4%

Endometrial Carcinoma

Endometrial carcinoma is primarily a disease of postmenopausal women with the peak incidence at the age of 55-65 years. Adenocarcinoma accounts for > 80% of endometrial cancers. Other types include papillary serous, clear cell, squamous, mucinous carcinoma, and sarcomas. Staging is based on histologic differentiation -grade 1 (least aggressive) to grade 3 (most aggressive) and extent of spread, including invasion depth, cervical involvement -glandular involvement versus stromal invasion, and extrauterine metastases. Endometrial carcinoma has been classified into 2 groups on the basis of pathogenetic factors.

Type 1 carcinoma

It accounts for about 75% to 85% of the carcinoma and arises from often with a history of unopposed estrogen exposure or hyperplastic endometrium. Type I is so called estrogen-dependent, which appears mostly in pre- and perimenopausal women. It is usually of the low-grade endometrioid type, and carries a good prognosis.

Type 2 carcinoma

It occurs in the background of atrophic endometrium (3). Type 2 carcinoma is estrogen independent, diagnosed mostly in postmenopausal women. It is often high grade tumor with poor prognosis.

There are several risk factors associated with endometrial hyperplasia and carcinoma.

Risk factors for endometrial carcinoma :(3, 27)

- Early menarche <10 yrs
- Late menopause >55 yrs
- Nulliparity
- Unopposed estrogen therapy
- Obesity
- Diabetes
- Liver disease
- Persistent / Recurrent bleeding
- Hypertension
- Atypical hyperplasia
- Tamoxifen therapy
- HNPCC syndrome

Endometrial hyperplasia

Endometrial hyperplasia is defined as an increase in the glandular to stromal tissue ratio to more than one (3). Endometrial hyperplasia which increases the risk of endometrial carcinoma, comprises a wide spectrum of histological changes from simple aggregation of the normal-looking proliferate glands at one extreme to the changes that are difficult to distinguish from carcinoma at the other end of the spectrum. Endometrial hyperplasia is clinically important because they may cause abnormal bleeding, result from hormonal therapy or precede or occur simultaneously with endometrial cancer. Most cases of endometrial hyperplasia result from high levels of estrogens, combined with insufficient levels of the progesterone hormones which counteract estrogen's proliferative effects on the endometrium.

Not only does the concern exist for atypical hyperplasia progressing to invasive cancer, but numerous studies found concurrent carcinoma at rates ranging from 17-52%. Part of the difficulty in diagnosing concurrent carcinoma is due to lack of reproducibility in diagnosing hyperplasia, especially atypical hyperplasia versus carcinoma.

Type of hyperplasia and progression to carcinoma

[Kurman et al (28])

Type of hyperplasia	Progression to cancer (%)
Simple(cystic without atypia)	1
Complex (adenomatous without atypia)	3
Simple(cystic with atypia)	8
Complex(adenomatous with atypia)	29

Endometrial polyp

Endometrial polyps are localized hyperplastic overgrowths of endometrial glands and stroma around a vascular core that form a sessile or pedunculated projection from the surface of the endometrium. Single or multiple polyps can occur that range from a few millimeters to several centimeters in size. Endometrial polyps are rare among women younger than 20 years of age. The incidence rises steadily with increasing age, peaks in the fifth decade of life, and gradually declines after menopause. Women with Hereditary Nonpolyposis Colon Cancer syndromes may have an increased incidence of endometrial polyps with malignant changes compared to the general population. Large endometrial polyps can also be associated with tamoxifen use. These polyps are associated with a higher risk of neoplasia.

Endometrial intraepithelial neoplasia (EIN) is a precursor to endometrioid endometrial adenocarcinoma characterized by monoclonal growth of mutated cells, a distinctive histopathologic appearance, and 45-fold elevated cancer risk (29). EIN within polyps are best recognized as geographic regions of contiguous glands with an architecture and cytology readily distinguished from that of the background polyp. EIN features are more commonly seen in endometrial polyps with metaplastic changes (30).

Endometrial atrophy

Endometrial atrophy describes the loss of glandular and stromal elements of the endometrium and arises following the withdrawal of endogenous ovarian steroids. Endometrial atrophy is the most common cause of abnormal postmenopausal bleeding. It usually occurs after a considerable number of years after menopause. The thin atrophic endometrium in postmenopausal women is prone to superficial ulceration that can lead to bleeding. The functional layer of endometrium is difficult or impossible to separate from the basalis. Tissue biopsy from atrophic endometrium is sparsely cellular and is often inadequate.

Investigation modalities

Imaging techniques of the endometrium

- Transabdominal ultrasonography(TAS)
- Trasvaginal ultrasonography(TVS)
- Ultrasound with Colour Doppler imaging
- Saline infusion sonohysterography(SIS)
- Computed Tomography(CT)
- Magnetic Resonance Imaging(MRI)

Transabdominal ultrasonography

TAS is performed through subcutaneous fat and abdominal wall muscles and uses the full urinary bladder as an acoustic window. In gynaecology the frequency of probes range from 3 to 5 MHz.It is used as the first line investigation in most of the gynaecological work up of the disease and for follow up.

Advantages

- Non invasive
- Wide field of view

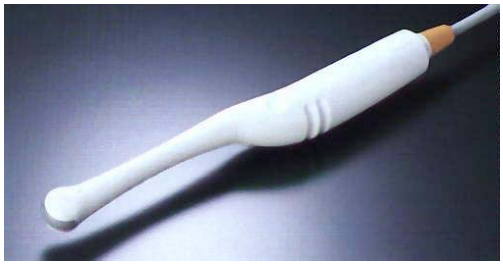
- Suitable for all ages
- Suitable for large masses
- Chaperone not required
- Easy availability

Disadvantages

- Poor resolution due to low probe frequency
- Requires full bladder
- Bowel gases may obscure the view
- Observer dependent
- Images affected by maternal habitus

Transvaginal ultrasound

TVS is now being extensively used in the Obstetrics and Gynaecology for imaging of pelvic pathology. Gynecologic transvaginal ultrasound uses a transducer placed in the vaginal part of a woman. This transducer is made up of special shape that can fit into vagina. It uses a probe frequency of 5 to 8 MHz. Transvaginal ultrasound technique allows placement of high frequency probe close to target pelvic organs to demonstrate anatomic detail not duplicated by transabdominal approach. Pelvic ultrasound evaluates the bladder, ovaries, uterus, cervix, fallopian tubes.



TRANSVAGINAL ULTRASOUND

Uses in Gynaecology

- To assess pelvic organs.
- To diagnose and manage gynecologic problems including endometriosis, leimyoma, adenomyosis, ovarian cysts.
- In perimenopausal and postmenopausal bleeding.
- To identify ovarian growth and other adnexal masses.
- In the screening and diagnosis of gynaecological cancer.
- In infertility treatments.
- Detect the cause of pelvic pain.
- Observe for the pelvic inflammatory disease.
- Check for intrauterine device (IUD).

Advantages

- Increased resolution in imaging the pelvic organs due to high probe frequency and proximity to the organs.
- Empty bladder.
- Not dependent on maternal habitus.
- Superior to CT and equivalent to MRI regarding myometrial, cervical and parametrial involvement in carcinoma endometrium.

Disadvantages

- Internal examination
- Cannot be used in all ages
- Operator dependent
- Chaperone required
- Possible discomfort

Normal findings of the endometrium (31)

- Paediatric endometrium:thin,echogenic line
- During menstruation: thin, echogenic line 1–4 mm in thickness
- Proliferative phase: 5-7 mm, echogenic
- Ovulatory endometrium: upto 11 mm thick, trilaminar appearance
- Secretory phase: 7-16 mm , echogenic
- Postmenopausal endometrium: Thin, homogenous,echogenic line less than 5 mm

Abnormal findings of the endometrium (31, 32)

-Endometrial polyp: Focal homogenous endometrial thickening.

-Endometrial hyperplasia: Uniform, diffuse thickening, echogenic.

-Endometrial carcinoma: Thick, echogenic, heterogenous, endometrial myometrial interface irregular, loss of endometrial halo.

-Submucosal fibroid- hypoechoic, solid mass with distortion of uterine cavity

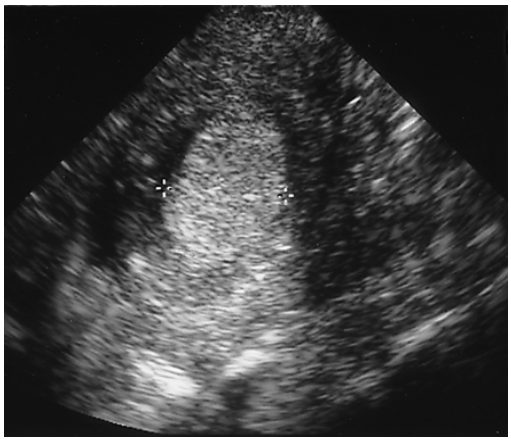
-Tamoxifen induced changes: Thickening associated with sub endometrial cysts

Doppler imaging

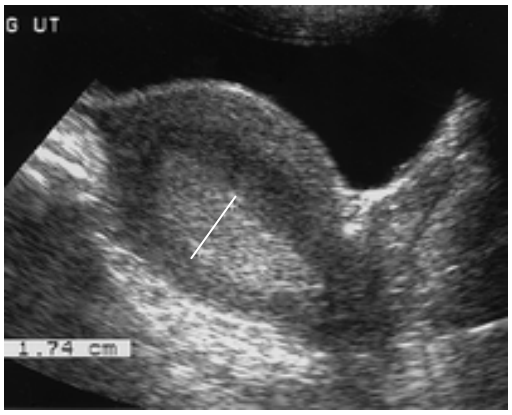
The value of Doppler and color Doppler US in distinguishing benign from malignant endometrial disease is controversial. Significant overlap in Doppler indices (ie, peak systolic velocity, resistive index, pulsatility index) in benign and malignant endometrial processes reduces the value of Doppler US in characterizing endometrial masses. Color and power Doppler US may occasionally aid in determining the presence and extent of tumor invasion and ensuring that biopsies are directed toward regions with increased blood flow (33).

Saline infusion sonohysterography

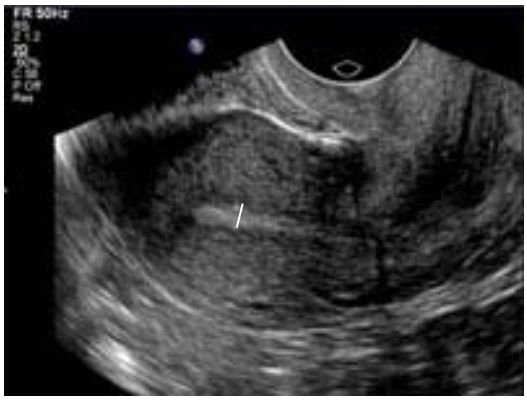
Trans vaginal ultrasonography immediately following instillation of 10 ml saline in the uterine cavity provides excellent visualization of the endometrium. Polyps are best seen at sonohysterography and appear as echogenic, smooth, intracavitary masses outlined by fluid (34). Sonohysterography with 93% sensitivity, 56%



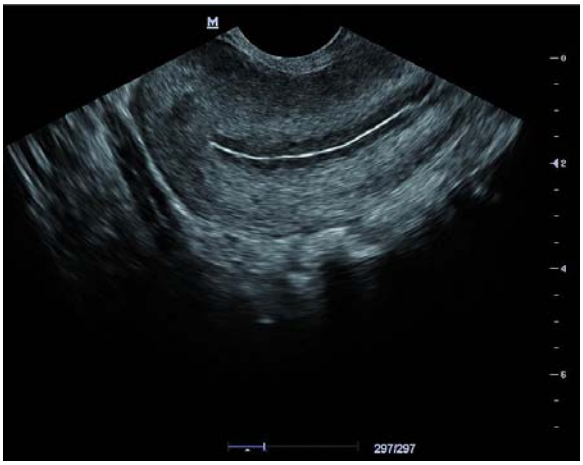
ENDOMETRIAL CARCINOMA



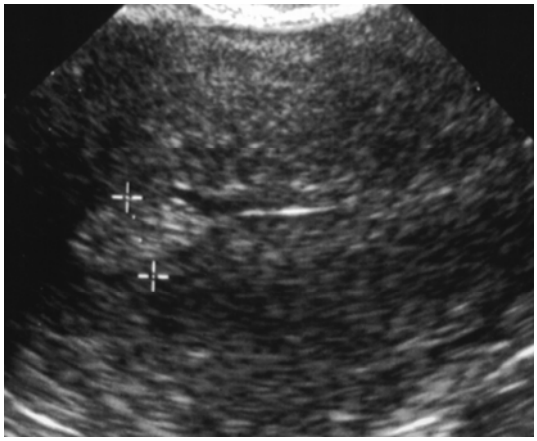
ENDOMETRIAL HYPERPLASIA



THICKENED ENDOMETRIUM



ATROPIC ENDOMETRIUM



ENDOMETRIAL POLYP

specificity, 86% PPV, and 71% NPV is considered better for diagnosing focal intrauterine lesion (53).

CT/MRI

CT and MRI are more accurate staging modalities than ultrasound. Both techniques allow survey of the entire pelvis, abdomen, thorax, and brain. They are more superior in detecting enlarged abdominal or pelvic lymph nodes and in depicting intraperitoneal, omental, or mesenteric metastases. MRI has 76% sensitivity and 92% specificity (52). In addition, USG is inferior to CT in assessing pelvic sidewall extension and adjacent organ invasion but USG is cost effective with easy availability.

Endometrial sampling techniques

- Pap smear
- Aspiration cytology
- Dilatation and curettage
- Hysteroscopy guided biopsy

Pap smear

- It is primarily used as a screening test for preinvasive and early invasive cervical carcinoma.
- It is a noninvasive and cost-effective test but it is inadequate and insensitive to be used as a screening test or diagnostic test for endometrial diseases (35).
- Only 50% of the endometrial cancer is present are positive for (glandular) cancer cells. This is not a high enough percentage to be used as the primary diagnostic test.

Aspiration cytology

- It is used as one of the first line investigations of postmenopausal bleeding.
- Various models are available like the Vabra aspirator, Pipelle aspiration etc.
- Advantages are that they out patient procedure and cost effective.
- The sensitivity of the procedure is 81.63% and the specificity is 83.33%.(54)
- Major limitations are they are invasive, small focus are missed, a risk of uterine perforation and inability to sample in cervical stenosis.

Dilatation & curettage

-Introduced in 1943 and been used since for endometrial sampling.

-Only less than half of the uterine surface is sampled and the probability of missing the diagnosis is 10-25% and fails to diagnose 70% of all focal intracavitary lesions.

- The sensitivity, specificity, PPV, and NPV of dilation and curettage were 47, 68, 57 and 59%, respectively. (53)

-It is being replaced by other modalities due to the blind nature of the procedure, invasive, risk of uterine perforation and infection, need for anesthesia, and inadequate sampling (36).

Hysteroscopy

- Hysteroscopy is considered the gold standard investigation in abnormal uterine bleeding.
- Hysteroscopy has sensitivity and specificity of 84% and 88% respectively (52).
- It is the inspection of the uterine cavity by endoscope. It allows for the diagnosis of intrauterine pathology and serves as a method for surgical intervention.
- It allows direct visualisation of the uterine cavity enabling guided biopsy, without cervical dilatation and could be done as a office procedure
- Disadvantages are the cost of instruments, operator expertise and risk of uterine perforation.

Contemporary studies

1. **Transvaginal ultrasonography of the endometrium in postmenopausal Japanese women** (37).

The aim of the study was to determine the cut-off level of endometrial thickness for detecting endometrial disease on a large scale of screening and to examine the usefulness of TVS for screening endometrial disease in postmenopausal Japanese women. The study involved a total of 1,400 women in whom TVS was performed and then compared with histopathological specimen. The prevalence of endometrial disease was seen in 2.3% of asymptomatic and 21% of symptomatic women. A 3 mm cut off has 94% sensitivity, 70 specificity and 46% PPV in detecting endometrial disease in symptomatic cases. In asymptomatic cases for a similar cut off the values were 90%, 84%, 12% respectively. They concluded that TVS did not appear to be an effective screening method in asymptomatic postmenopausal women. They recommend a 4 mm cut off level in symptomatic Japanese women as normal.

2. **Transvaginal sonography of the endometrium in a representative sample of postmenopausal women** (38).

The aim of the study of the study was to assess the endometrial thickness using TVS in a representative sample of postmenopausal women

and to evaluate whether the technique can be used for screening of endometrial carcinoma. A random sample of total population was invited for the study of which 827 women in the age 45-80 years were screened. The only exclusion criterion was hysterectomy. Endometrial thickness of less than 4 mm was not investigated further. Women with endometrial thickness of 5-7 mm and non measurable cases were reassessed 1 year later and if ≥ 8 mm were investigated directly.33% of the women were on some form of hormone substitution. The endometrial thickness was grouped into ≤ 4 mm, 5-7 mm and ≥ 8mm. In postmenopausal women not on estrogens the thickness seen were 90%, 7% and 3%; on medium potency estrogens 49%, 40% and 11%; on low potency estrogens 85%,6%, and 9% respectively. The prevalence of endometrial carcinoma was 0.2% and for benign polyps 3.2% and no cases of endometrial hyperplasia were reported. The authors concluded that the results do not support TVS for generalised screening for endometrium.

3. **Transvaginal sonography of the endometrium in south Indian postmenopausal women** (39).

The aim of the study was to compare the transvaginal sonographically-measured endometrial thickness with the histopathological diagnosis in postmenopausal women. Eighty postmenopausal women were studied prospectively. All of them underwent transvaginal sonography followed by

either an office dilatation and curettage or a hysterectomy. Eight women had endometrial carcinoma and their mean endometrial thickness was 12.6±5 mm. Taking 4 mm endometrial thickness as cut off the sensitivity of transvaginal scan to detect endometrial pathology was 97%, specificity 98%, positive predictive value 97% and negative predictive value 94%. They concluded that measurement of endometrial thickness by transvaginal scan is a good screening test in postmenopausal women for differentiating endometrial pathology from those who do not have an endometrial lesion

4. **Transvaginal ultrasonography of the endometrium in women with postmenopausal bleeding: is it always necessary to perform an endometrial biopsy?** (40)

This study was undertaken to evaluate whether it was possible to abstain from performing an endometrial biopsy when endometrial thickness according to transvaginal ultrasonography was ≤ 4 mm in women with postmenopausal bleeding or irregular bleeding during hormone replacement therapy. A total of 361 women were involved in the study. They were reexamined at 4 and 12 months if endometrium was ≤ 4mm or endometrial biopsy was performed if ≥ 5 mm. They were also instructed to return if they had recurrent bleeding, in which case transvaginal ultrasonography was performed and an endometrial biopsy specimen was obtained. Endometrial malignancy was diagnosed in 0.6% of the women with an endometrial

thickness ≤ 4 mm. Endometrial biopsy was performed because of recurrent bleeding in 6.1% of cases and because of endometrial thickening in 8.1%. No cancer or hyperplasia was subsequently diagnosed among the women with an endometrial thickness ≤ 4 mm. Endometrial cancer was diagnosed in 18.7% of the women with an endometrial thickness ≥ 5 mm. They concluded that a transvaginal ultrasonography and or a cervical cytologic examination is an adequate form of management for women with postmenopausal bleeding or irregular bleeding during hormone replacement therapy as long as endometrial thickness is ≤ 4 mm

5. **Can ultrasound replace dilatation and curettage? A longitudinal evaluation of postmenopausal bleeding and transvaginal sonographic measurement of the endometrium as predictors of endometrial cancer** (41).

The study purpose was to evaluate postmenopausal bleeding and TVS measurements of endometrial thickness as predictors of endometrial cancer and atypical hyperplasia in women whose cases were followed up for ≥ 10 years after referral for postmenopausal bleeding. Of the 394 patients, it was possible to obtain records of 339 women. Thirty-nine of 339 women (11.5%) had endometrial cancer, and 5 women (1.5%) had atypical hyperplasia. The relative risk of endometrial cancer in women who were

referred for postmenopausal bleeding was 63.9; the corresponding relative risk for endometrial cancer and atypical hyperplasia together was 72.1 compared with women of the same age from the general population. No woman with an endometrial thickness of ≤ 4 mm was diagnosed as having endometrial cancer. The relative risk of the development of endometrial cancer in women with an endometrial thickness of > 4 mm was 44.5 compared with women with an endometrial thickness of ≤ 4 mm. The reliability of endometrial thickness (cutoff value, ≤ 4 mm) as a diagnostic test for endometrial cancer was assessed: Sensitivity, 100%; specificity, 60%; positive predictive value, 25%; and negative predictive value, 100%. No endometrial cancer was diagnosed in women with a recurrent postmenopausal bleeding who had an endometrial thickness of ≤ 4 mm at the initial scan. The authors conclude that postmenopausal bleeding incurs a 64-fold increase risk for endometrial cancer. There was no increased risk of endometrial cancer or atypia in women who did not have recurrent bleeding, whereas women with recurrent bleeding were a high-risk group. No endometrial cancer was missed when endometrial thickness measurement (cutoff value, ≤ 4 mm) was used, even if the women were followed up for ≤ 10 years. We conclude that transvaginal sonographic scanning is an excellent tool for the determination of whether further investigation with curettage or some form of endometrial biopsy is necessary.

6. **Gray-scale ultrasound morphology in the presence or absence of intrauterine fluid and vascularity as assessed by color Doppler for discrimination between benign and malignant endometrium in women with postmenopausal bleeding** (42).

   The objective was to determine if gray-scale ultrasound morphology in the presence or absence of intrauterine fluid and endometrial vascular morphology by colour Doppler USG can discriminate between benign and malignant endometrium in women with postmenopausal bleeding. 95 women with postmenopausal bleeding and endometrial thickness > or = 4.5 mm were included. There were no statistically significant differences in ultrasound findings between benign and malignant endometria of uterine cavities without fluid. The sensitivity, false positive rate, positive and negative likelihood ratios of the morphlogical findings were as follows: heterogeneous echogenicity, 80%, 29%, 2.74, 0.28; irregular surface, 89%, 33%, 2.70, 0.17; and both, 78%, 12%, 6.59, 0.25. There was no significance associated with fluid in the endometrial cavity. The authors concluded that heterogeneous echogenicity and an irregular surface of a focal lesion or of the endometrium are useful ultrasound criteria for predicting endometrial malignancy. Assessment of vascular morphology using color Doppler ultrasound is of limited value for discrimination between benign and malignant endometrium.

Aim of the study

AIM OF THE STUDY

1) To evaluate the role of transvaginal ultrasonography in evaluating endometrial pathology in postmenopausal women using endometrial thickness measurements and morphological changes within the endometrium to define abnormality and able to choose the technique of biopsy if needed.

2) To assess the utility of TVS as a routine screening tool in detecting endometrial disease in all postmenopausal women.

Materials and methods

MATERIALS AND METHODS

A total of 105 postmenpausal women who attended the Gynaecology outpatient department at the Institute of Obstetrics and Gynecology from April 2008 to September 2009 were screened for this study.

The women were selected based on the inclusion and exclusion criteria.

Inclusion criteria

- Last menstrual cycle at least one year back (Menopausal women).
- All patients with complaints of post menopausal bleeding.
- Endometrial thickness more than 5 mm in asymptomatic women.
- Age 40 years and above.
- Not on any hormonal treatment.
- Absence of other pelvic diseases and blood dyscrasis.

Exclusion criteria

- Carcinoma cervix.
- Other pelvic pathologies or blood dyscrasis.
- Hormonal treatment.
- Endometrial thickness less than 5 mm in asymptomatic women.

The subject is asked to empty the bladder before the examination. A small amount of gel is applied over the transducer tip and the probe is covered by a condom. A small amount of lubricant gel is applied over the probe to allow easy insertion. Transvaginal transducer of 5.5 to 8.5 MHz was used.

- The endometrim was imaged in the sagittal plane.
- Both layers of the endometrium were measured that is the anterior and the posterior layers.
- The thickest point of the endometrium was measured from the anterior to posterior myometrial-endometrial junction.
- If there was fluid in the cavity each layer was measured separately and summed up.
- Morphological changes were determined by irregular endometrium, heterogeneous echo texture, focal thickening and indistinct endometrial borders.
- The presence of endometrial halo (hypoechoic area between the endometrium and inner myometrium) was noted.

Transvaginal ultrasonography diagnosis was given as

- Atrophic: Thin line, homogenous, endometrial thickness <5mm.
- Thickened: homogenous, regular margins, endometrial thickness <10mm with no features suggestive of any abnormality.
- Endometrial polyp: Focal homogenous endometrial thickening, regular margins.
- Endometrial hyperplasia: Uniform, diffuse thickening, echogenic, endometrial thickness >10 mm or <10 mm thickness when features suggestive of hyperplasia present
- Endometrial carcinoma: Thick, echogenic, heterogenous, irregular endometrial myometrial interface, loss of endometrial halo.

Histopatholgical diagnosis of the endometrium was obtained from specimens obtained by dilatation and curettage or operative hysteroscopy guided biopsy or by hysterectomy. The histopathology of the endometrium was considered gold standard.

Results

RESULTS

In this prospective descriptive study,

105 postmenopausal women were involved in the study and outcome analysed using various parameters. The results were statistically analyzed using Chi-square test and frequency and percentage analysis

Sample size- 105

TVS performed in 105

Histopathological diagnosis obtained in 105

DISTRIBUTION PARAMETERS:

Table 1: Age distribution

Age (yrs)	No.	%
41-45	14	13.3
46-50	34	32.4
51-55	29	27.6
56-60	19	18.1
>60	9	8.6
Total	105	100

Majority of the women belong to the age group 46-50 yrs (32.4%).

The mean age of distribution: 52.9 yrs.

Age Distribution (%)

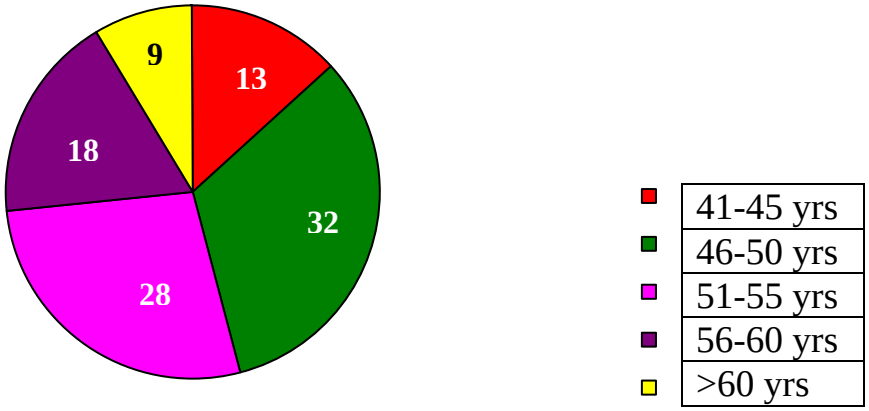


Table 2: Parity distribution

Parity	No.	%
0	4	3.8
I	6	5.7
II	17	16.2
III	33	31.4
IV	25	23.8
V and above	20	19
Total	105	100

Women of all parity were included.

Majority of the women were had 3 or more parous pregnancies (74.28%).

Table 3: Distribution of years of menopause

Yrs of menopause	No.	%
1-5	62	59
6-10	24	22.9
11-15	10	9.5
>15	9	8.6
Total	105	100

Most of the women had attained menopause within 1 to 5 years.

The mean number of years in menopause was 6.2 years.

Table 4: Distribution of associated diseases

Associated diseases	**No.**	**%**
Obesity	25	23.8
Diabetes mellitus	6	5.7
Hypertension	5	4.76
Hypertension & Diabetes mellitus	2	1.9
Obesity& HT	10	9.52
Obesity & DM	4	3.8
HT &DM &Obesity	2	1.9
Carcinoma caecum	1	0.95
Carcinoma breast	1	0.95
Anaemia	1	0.95

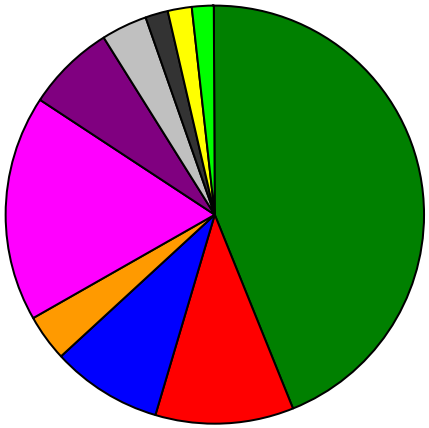
Of the 105 women screened, 32 women (30.5%) had co morbid diseases.

37.1% (39/105) were obese (obesity was determined as BMI >30).

Hypertension was the most common co morbid condition seen in 19 women .Of these 10 of them were obese, 2 had associated diabetes mellitus and 2 were diabetic and obese.

There were 2 women with prior carcinoma, treated and on follow up.

Distribution of Associated disease



- Obesity (23.8%)
- Diabetes mellitus (5.7%)
- Hypertension (4.7%)
- HT& DM (1.9%)
- Obesity& HT (9.5%)
- Obesity & DM (3.8%)
- HT &DM &Obesity (1.9%)
- Carcinoma caecum (1%)
- Carcinoma breast (1%)
- Anaemia(1%)

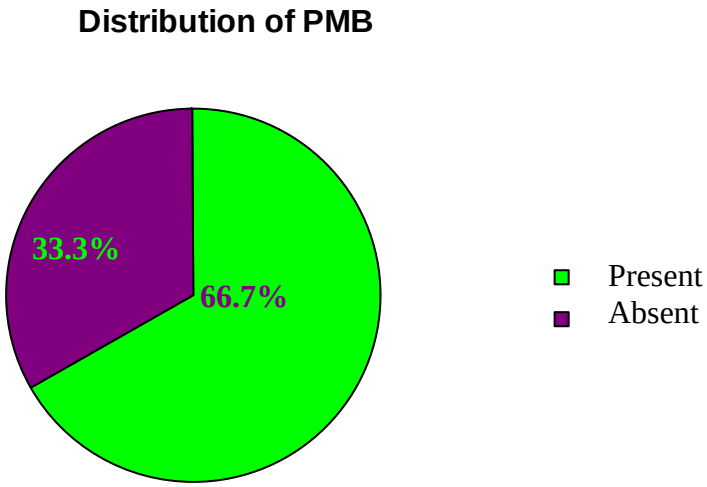
Table 5: Distribution of complaints (post menopausal bleeding)

PMB	**No.**	**%**
Yes	70	66.67
No	35	33.33
Total	105	100

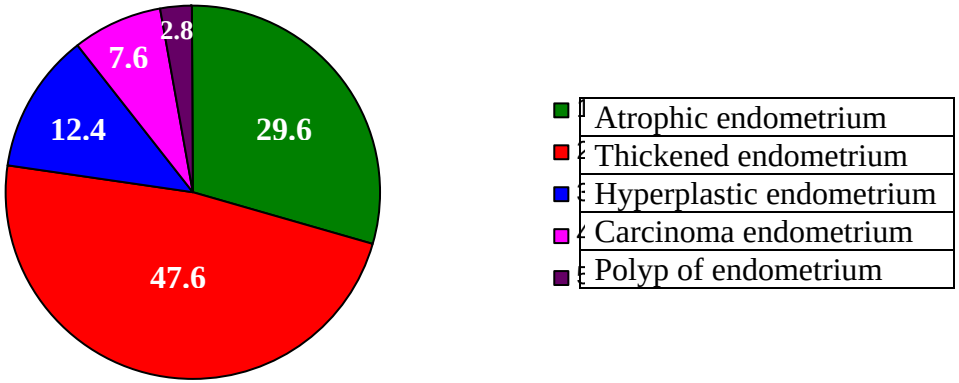
70 women had postmenopausal bleeding and 35 women were asymptomatic of the 105 women screened representing 66.6% and 33.3% of the study group respectively.

Table 6: Distribution of findings in TVS of endometrium

TVS findings	**No.**	**%**
Atrophic	31	29.6
Thickened	50	47.62
Hyperplasia	13	12.38
Carcinoma	8	7.6
Polyp	3	2.8
Total	105	100


Distribution of PMB
33.3%
66.7%
Present
Absent

Distribution of findings in TVS



Of the subjects screened the TVS findings determined were:

Atrophic and thickened endometria were considered normal findings which was 81 of 105 (77.1%).

The following were considered abnormal seen in 22.9% (24/105)

Endometrial hyperplasia was seen in 13 of 105 women (12.3%), endometrial carcinoma in 8 women (7.62%) and endometrial polyp in 3 women (2.8%).

Table 7: Distribution of findings in histopathology of endometrium

Histopathology	**No.**	**%**
Atrophic	50	47.62
Proliferative / Secretory	35	33.33
Hyperplasia	9	8.57
Carcinoma	7	6.66
Polyp	4	3.8
Total	105	100

The histopathological diagnosis was considered gold standard.

The following were considered normal finding seen in 85/105(81%) of all women.

Atrophy of endometrium seen in 47.6%, secretory and proliferative endometrium seen in 33.3%.

Abnormal findings were Endometrial Hyperplasia in diagnosed in 9 women, endometrial carcinoma in 7 women and endometrial polyp in 4 women.

Abnormal findings constituted 20/105 (19%) of the study population.

GENERAL PARAMETERS

Table 8: Comparison of age with histopathology

HPE / AGE (yrs)	Normal	Abnormal	Total
≤50	43	5	48
51-55	23	6	29
56-60	12	7	19
>60	7	2	9
Total	85	20	105

P value-0.097 – not significant

There was no statistically significant difference in the age of the patient and the presence of endometrial disease.

Table 9: Comparison of years of menopause with histopathology

HPE / **Yrs of menopause**	Normal	Abnormal	Total
1- 5	53	9	62
6- 10	21	3	24
11-15	5	5	10
>15	6	3	9
Total	85	20	105

P value-0.031, significant

There was statistically significant difference between the total number of years after menopause and endometrial disease.

Table 10: Comparison of co-morbid disease with histopathology

HPE / **Disease distribution**	Normal	Abnormal	Total
Diabetes	7	3	10
Hypertension	9	6	15
Diabetes & Hypertension	1	3	4
Other carcinoma	0	2	2
Nil	68	6	74
Total	85	20	105

P value- 0.0, significant

There is significant difference in the ‘P’ value between hypertension, diabetes, and carcinoma of breast and caecum with endometrial disease.

Table11: Comparison of BMI with histopathology

HPE / BMI	Normal	Abnormal	Total
<30	57	9	66
≥30	28	11	39
Total	85	20	105

P value-0.066, not significant

There is no statistically significant difference in women who are obese and endometrial disease.

Table 12: Comparison of post menopausal bleeding with histopathology

HPE / PMB	Normal	Abnormal	Total
Present	52	18	70
Absent	33	2	35
Total	85	20	105

P value-0.14, significant

There is significant association between PMB and endometrial disease.

Endometrial disease is present more in women with postmenopausal bleeding than those without bleeding.

TVS PARAMETERS

Table 13: Comparison of appearance of endometrium with histopathology

HPE / **Appearance**	Normal	Abnormal	Total
Homogenous	84	12	96
Heterogeneous	1	8	9
Total	85	20	105

Pearson Chi square value- 0.0, significant

Appearance of the endometrium is statistically significant in detecting endometrial abnormality

Accuracy of heterogeneous appearance in endometrial abnormality

HPE / **Appearance**	Endometrial disease	No endometrial disease	Total
Present	8	1	9
Absent	12	84	96
Total	20	85	105

Sensitivity: 40% PPV: 88.9%

Specificity: 98.8% NPV: 87.5 %

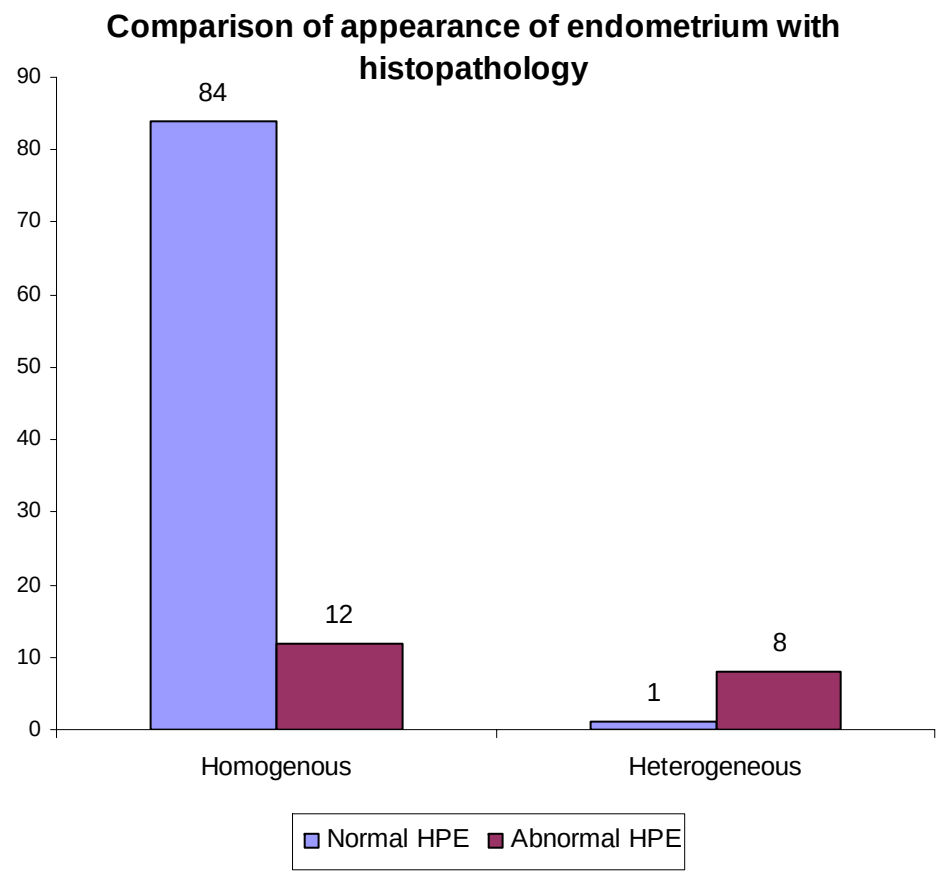

Comparison of appearance of endometrium with histopathology
90
80
70
60
50
40
30
20
10
0
84
12
1
8
Homogenous
Heterogeneous
Normal HPE
Abnormal HPE

Table 14: Comparison of characteristic feature & margin of endometrium with histopathology

HPE / **Characteristics & margin**	Normal	Abnormal	Total
Thin line	31	-	31
Diffuse/regular margin	52	11	63
Diffuse/irregular margin	1	7	8
Focal/regular margin	1	2	3
Focal/irregular margin	-	-	-
Total	85	20	105

Pearson Chi square value- 0.0, significant

Thin line, diffuse with regular margin – normal

Diffuse with irregular margin, Focal with regular margin, Focal with irregular margin were abnormal

Accuracy of characteristic feature & margin in detecting endometrial abnormality

HPE / **Characteristics**	Endometrial disease	No endometrial disease	Total
Present	9	2	11
Absent	11	83	94
Total	20	85	105

Sensitivity: 45%, PPV: 81.8%, Specificity: 97.6%, NPV: 88.3%

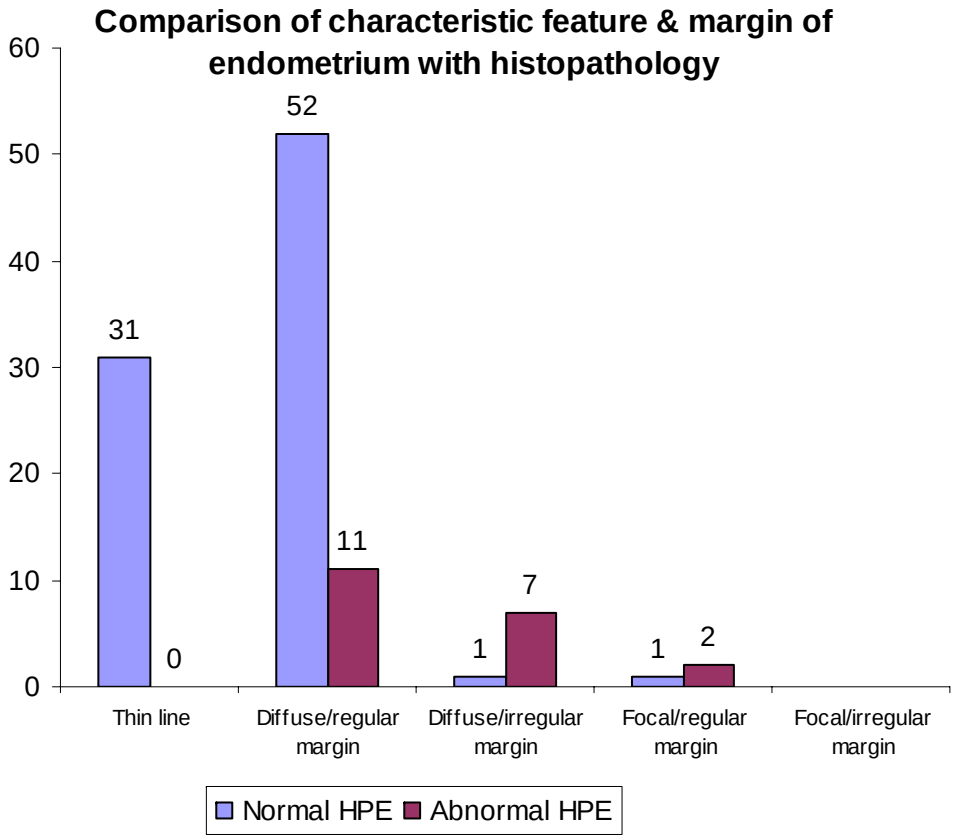

Comparison of characteristic feature & margin of endometrium with histopathology
60
50
40
30
20
10
0
31
0
52
11
1
7
1
2
Thin line
Diffuse/regular margin
Diffuse/irregular margin
Focal/regular margin
Focal/irregular margin
Normal HPE
Abnormal HPE

Table 15: Comparison of endometrial halo with histopathology

HPE / **Endometrial halo**	Normal	Abnormal	Total
Present	84	13	97
Absent	1	7	8
Total	85	20	105

Pearson Chi square value- 0.0, significant

Endometrial halo was significantly associated with endometrial abnormality

Accuracy of endometrial halo in detecting endometrial abnormality

HPE / **Endometrial halo**	Endometrial disease	No endometrial disease	Total
Absent	7	1	8
Present	13	84	97
Total	20	85	105

Sensitivity: 53.8%, PPV: 87.5%

Specificity: 98.8%, NPV: 86.6%

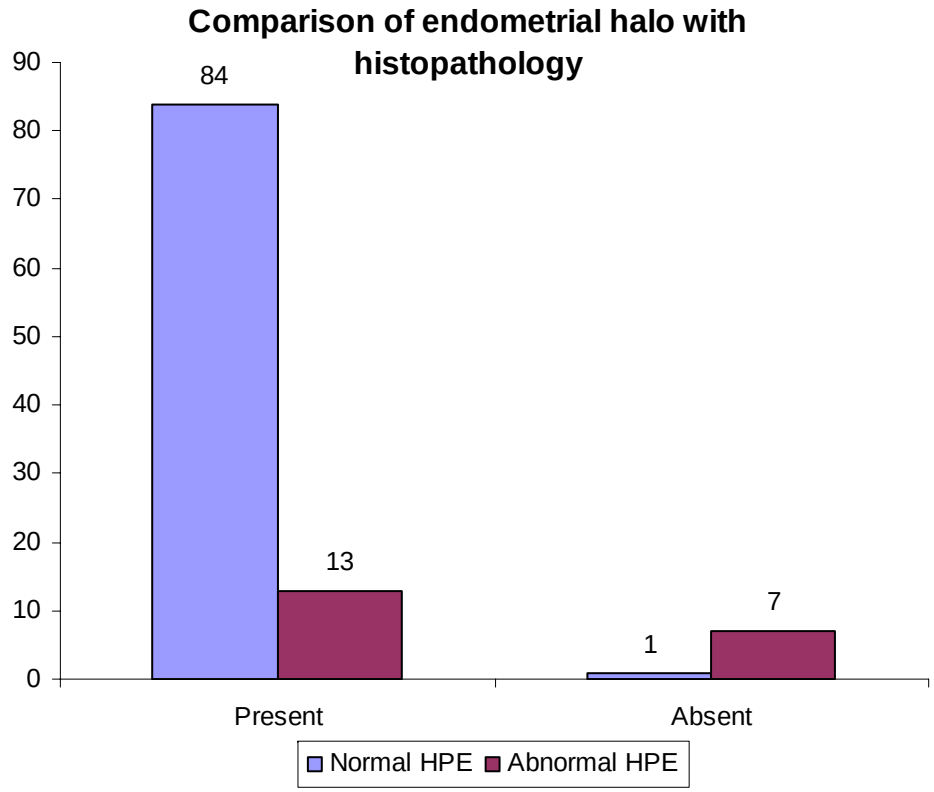

Comparison of endometrial halo with histopathology
90
80
70
60
50
40
30
20
10
0
84
13
1
7
Present
Absent
Normal HPE
Abnormal HPE

Table 16: Comparison of endometrial thickness with histopathology in patients with symptom (post menopausal bleeding)

HPE / **Endometrial thickness**	Normal	Abnormal	Total
<5 mm	30	-	30
<10mm	17	5	22
>10mm	5	13	18
Total	52	18	70

P value- 0.0, significant

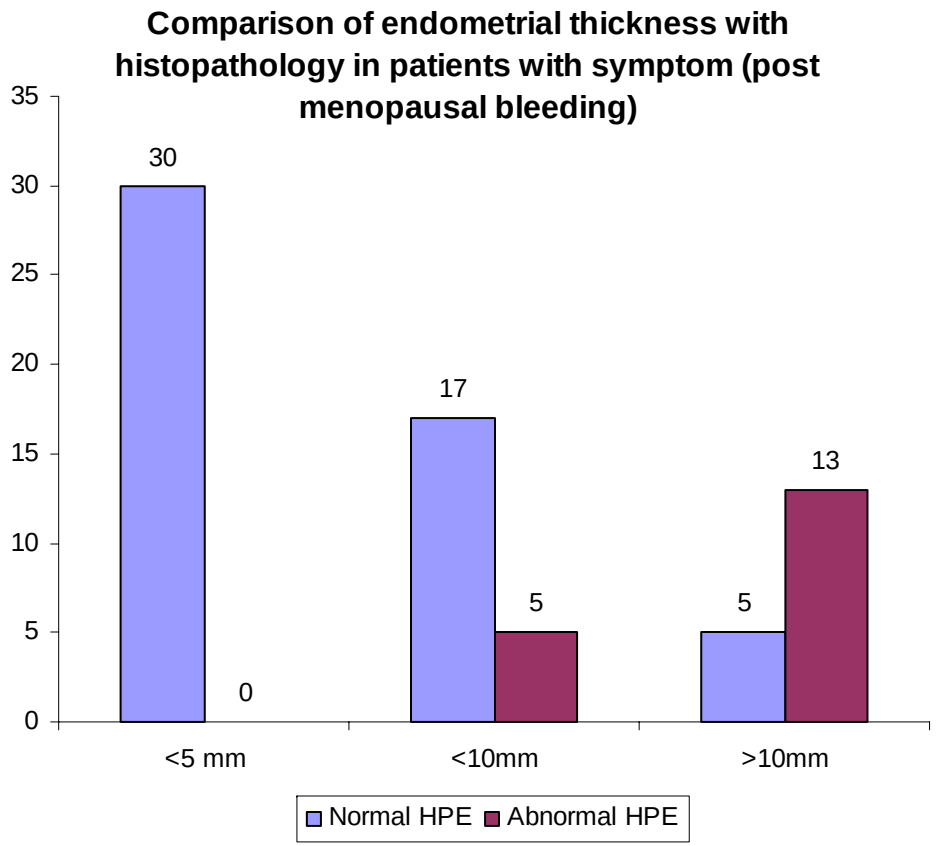
There is significant association between endometrial disease and endometrial thickness in women with post menopausal bleeding.

Endometrial thickness > 5 mm to define abnormality in PMB

HPE / **Endometrial thickness**	Endometrial disease	No endometrial disease	Total
Positive TVS	18	22	40
Negative TVS	0	30	30
Total	18	52	70

Sensitivity: 100%, PPV: 45%

Specificity: 57.7%, NPV: 100%


Comparison of endometrial thickness with histopathology in patients with symptom (post menopausal bleeding)
35
30
25
20
15
10
5
0
30
0
17
5
5
13
<5 mm
<10mm
>10mm
Normal HPE
Abnormal HPE

Endometrial thickness > 10 mm cut off in women with PMB to define abnormality

HPE / **Endometrial thickness**	Endometrial disease	No endometrial disease	total
Positive TVS	13	5	18
Negative TVS	5	47	52
Total	18	52	70

Sensitivity: 72.2%, PPV: 72.2%

Specificity: 90.4%, NPV: 90.4%

Table 17: Comparison of endometrial thickness with histopathology in patients without symptoms

HPE / Endometrial thickness	Normal	Abnormal	Total
<10mm	30	1	31
>10mm	3	1	4
Total	33	2	35

P value- 0.077, not significant

The endometrial thickness is not statistically associated with endometrial thickness in postmenopausal women without bleeding.

Endometrial thickness > 10 mm cut off in women without PMB to define abnormality

HPE / Endometrial thickness	Endometrial disease	No endometrial disease	Total
Positive TVS	1	3	4
Negative TVS	1	30	31
Total	2	33	35

Sensitivity: 50%, PPV: 25%

Specificity: 90.9%, NPV: 96.8%

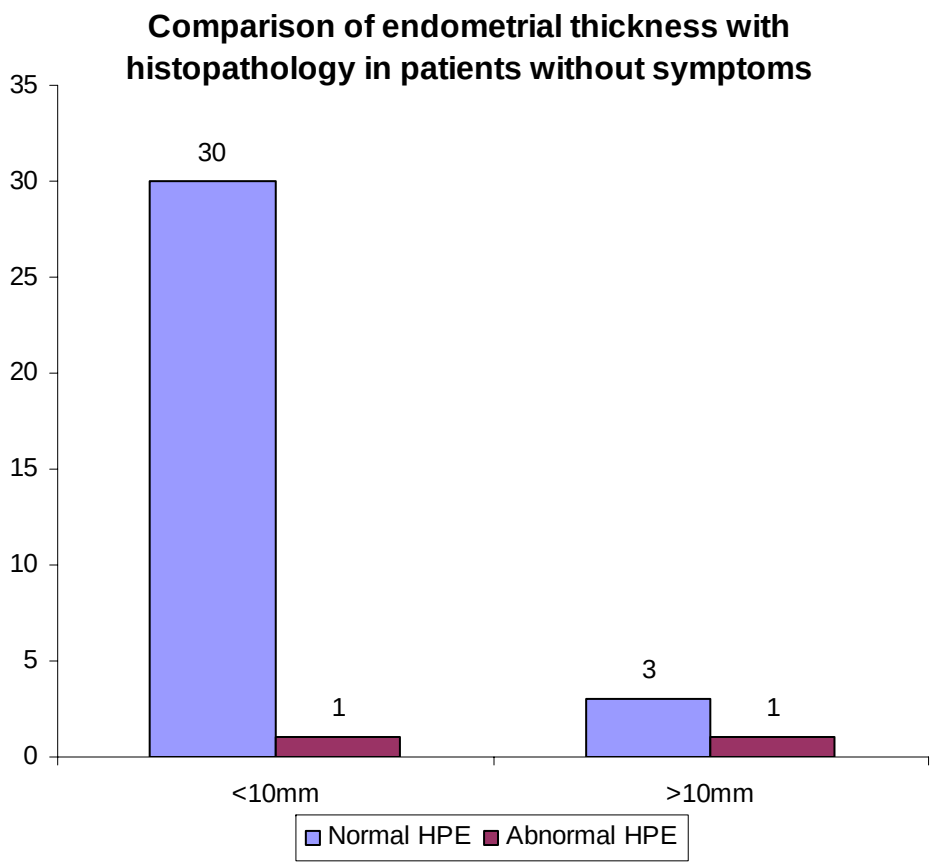

Comparison of endometrial thickness with histopathology in patients without symptoms
35
30
25
20
15
10
5
0
30
1
3
1
<10mm
>10mm
Normal HPE
Abnormal HPE

Table 18: Comparison of TVS with histopathology

HPE diagnosis / **TVS diagnosis**	Atropic endometrium	Carcinoma endometrium	Proliferative/ secretory endometrium	Endometrial polyp	Endometrial hyperplasia	Total
Atropic endometrium	26	-	5	-	-	31
Carcinoma endometrium	-	6	1	-	1	8
Endometrial Hyperplasia	1	-	7	3	4	15
Thickened endometrium	23	1	21	1	2	48
Endometrial polyp	-	-	1	-	2	3
Total	50	7	35	4	9	105

TVS detected 6 cases of endometrial carcinoma correctly, one was a complex hyperplasia and only 1 case was over diagnosed as it turned out to benign non pathological finding.

One case of endometrial carcinoma was missed and was diagnosed thickened endometrium.

4 cases of endometrial hyperplasia were detected co relating with HPE but over diagnosed 7 cases of normal endometrium.

2 cases of hyperplasia were missed and were detected as thickened endometrium.

None of the endometrial polyps were identified correctly on TVS.

3 cases of endometrial polyp were detected as hyperplasia and one as thickened endometrium.

2 cases detected as polyp were in fact hyperplasia of endometrium.

Of the 50 cases of endometrial atrophy 26 cases of atrophic endometrium were diagnosed by TVS.

In a total of 48 cases with thickened endometrium 23 cases designated as thickened in TVS were atrophic on HPE.

21 cases of thickened endometrium had benign normal histopathological finding.

Accuracy of diagnosis of endometrial abnormality in TVS

HPE / TVS diagnosis	Endometrial disease	No endometrial disease	Total
Positive TVS	16	10	26
Negative TVS	4	75	79
Total	20	85	105

Sensitivity 80% , Positive Predictive Value 61.54%

Specificity 88.24%, Negative Predictive Value 94.94%

Diagnostic Accuracy 86.67%

Table 19: Accuracy of diagnosis in women with PMB by TVS

HPE / TVS diagnosis	Endometrial disease	No endometrial disease	Total
Positive TVS	15	6	21
Negative TVS	3	46	49
Total	18	52	70

Sensitivity: 83.3%, PPV: 71.4%

Specificity: 88.5%, NPV: 93.9%

Table 20: Accuracy of diagnosis in women without PMB

HPE / **TVS diagnosis**	Endometrial disease	No endometrial disease	Total
Positive TVS	1	4	5
Negative TVS	1	29	30
Total	2	33	35

Sensitivity: 50%, PPV: 20%

Specificity: 87.9%, NPV: 96.7%

Table 21: Binary logistic regression

Variables	**df**	**Significance**
Years of menopause	1	0.017
Associated diseases	4	0.221
Postmenopausal bleeding	1	0.012
Appearance	1	0.217
Characteristic feature and margin	3	0.781
Endometrial halo	1	0.997
Endometrial thickness	2	0.84

There was strong association between postmenopausal bleeding significance-0.012

Years of menopause significance-0.017.

Discussion

DISCUSSION

The study was a prospective descriptive study.

- Most of the women belonged to 46 to 50 yrs of age with the range of age distribution between 42 to 73 yrs.
- Women of all parity were represented in the study.
- Majority of the patients had attained menopause within 1 to 5 years at the time of the study. The distribution range was between 1 to 26 years.
- 32.5% had associated co-morbid disease. 39 women were obese.
- 66.7% of the study group had postmenopausal bleeding and the rest were asymptomatic.
- Abnormal findings like endometrial carcinoma, polyp, and hyperplasia were detected in 22.9% of the women by TVS and in 19 % of women by histopathology.
- Factors like age, years of menopause, co- morbid diseases, obesity and postmenopausal bleeding were analysed with the histopathology of the endometrium. There was statistically significant association between postmenopausal bleeding ($p < 0.05$), years of menopause ($p < 0.05$) and the presence of co morbid diseases ($p < 0.01$) using the chi-square test.
- The study by Gull B et al (2001) reported that several risk factors including hypertension and diabetes was associated with increased endometrial thickness and abnormality (44).

- BMI and endometrial disease had no co relation in this study. Studies by Guven MA et al in 2004 (48) and van den Bosch T et al (45) have shown no association between endometrial abnormality and BMI.
- Binary logistic regression was used to identify the association of risk factors and endometrial abnormality. It had strong association in the presence of post menopausal bleeding and with advancing years of menopause.
- In the study done by Thomas Gredmark et al (43) the occurrence of PMB decreased with increasing age but the probability of cancer as the underlying cause increased with age. The peak incidence of endometrial carcinoma was found in women between 65 and 69 years of age. Also a histopathological finding of endometrial adenomatous hyperplasia or cancer was seen in about 15% of the postmenopausal women with bleeding, which justifies a thorough examination in these women.
- Trans vaginal ultrasound parameters take into consideration were appearance of the endometrial stripe (homogenous /heterogeneous), characteristic feature (diffuse/focal), margin (regular/irregular), endometrial halo (present/absent). All of them were found to statistically significant ($p < 0.01$)

The following observations were made:

TVS parameters	Sensitivity	Specificity	PPV	NPV
Heterogeneous appearance	40%	98.8%	87.5%	87.5%
Characteristic feature and margin	45%	97.6%	81.8%	88.3%
Endometrial halo	53.8%	98.8%	87.5%	86.6%

- The morphological features on TVS had a high specificity, positive predictive value and negative predictive value but an overall low sensitivity.
- Texture analysis of endometrium by G Michail et al (2007) (49) by gray scale ultrasound was to investigate the feasibility of texture analysis in characterising endometrial tissue as depicted in two-dimensional (2D) grayscale transvaginal ultrasonography in peri and postmenopausal women. The study analysed endometrium, endometrium plus adjacent myometrium, layer containing endometrial–myometrial interface using logistic regression model. Their results showed that TVS images can effectively differentiate malignant from benign endometrial tissue providing 86.0% specificity at 93.3% sensitivity using the cut-off level of 0.5 for probability of malignancy.

- Morphological changes in the endometrium have a high specificity and can be used reliably in the exclusion of abnormal endometrial findings but further investigation is needed in diagnosis of the disease.

Endometrial thickness	**Sensitivity**	**Specificity**	**PPV**	**NPV**
With PMB				
> 5 mm	100	57.7	45	100
> 10 mm	72.2	90.4	72.2	90.4
Without PMB > 10 mm	50	90.9	25	96.8

- In women with PMB there was significant association ($p<0.01$) with endometrial thickness but there was no significant association in women without symptoms.
- In patients with PMB a 5 mm cut off had 100% sensitivity but low specificity whereas when the cut off was increased to 10 mm sensitivity was reduced to 72.2% but increases specificity to 90.4%.
- This shows that a 5 mm cut off is highly accurate in excluding endometrial disease in PMB. As per the Compendium of Selected Publications by ACOG it recommends that if the endometrium is thin by TVS, most commonly defined as a thickness of ≤ 5 mm, the risk of cancer is sufficiently low that a biopsy may be deferred (22).

- In women with PMB when endometrium at 10 mm is considered normal the sensitivity and PPV is decreased to 72.2%.PMB is a strong risk factor for carcinoma and there is an increased probability of missing the diagnosis.
- A 10 mm cut off is acceptable in women without any symptoms with a high NPV of 96.8%. R. Smith Bindman et al (2004) under took a study to determine an endometrial thickness threshold that should prompt biopsy in a postmenopausal woman without vaginal bleeding. An 11 mm threshold yields a separation between those who are at high risk and those who are at low risk for endometrial cancer. In postmenopausal women without vaginal bleeding, the risk of cancer is approximately 6.7% if the endometrium is thick (> 11 mm) and 0.002% if the endometrium is thin suggesting that only at an 11 mm cut off in postmenopausal women without bleeding warrants the need for biopsy (46).
- Of note is the high proportion of patients falling in the 5–10 mm "grey zone" group. In the results the greater the endometrial thickness, the higher the incidence of endometrial cancer is present.

- The diagnosis by TVS in the study had 80% sensitivity, 88.2% specificity, 61.5% PPV, 94.4% NPV. The overall diagnostic accuracy in the study was 86.67%. Diaa El Mowafi et al (50) in the study of TVS

and hysteroscopy versus histopathology in postmenopausal women have shown sensitivity 73.9%, specificity 73.7%, PPV 77.3% and NPV 70%. The diagnostic accuracy was 73.4%

- TVS was able to detect 6 cases of carcinoma accurately and the diagnosis was missed in one case only.
- The diagnosis of polyp was missed by TVS and it might be increased by Saline Infusion Sonohysterography (SIS). Erdem M et al (51) in the study of TVS with SIS have demonstrated that the sensitivity and specificity of SIS in the diagnosis of endometrial polyps were 100% and 91.8%, respectively.
- There were differences in the identification of benign conditions. All types of endometrial hyperplasia (cystic, adenomatous, atypical) can cause diffusely smooth or, less commonly, focal hyperechoic endometrial thickening. (30)
- The study showed 83.3% sensitivity, 88.5% specificity, 71.1% PPV and 93.9% NPV in the diagnosis in women with PMB. When thickness alone was taken at a 5 mm cut off the values were 100%, 57.7%, 45% and 100%. B. Randelzhofer et al (55) in a study analyzed various sonomorphological criteria prospectively in 321 women. Using the cut-off point of 0.1 for the probability of endometrial malignancy, the sensitivity and specificity were 96.8% and 61.9%, respectively, with an

accuracy of 72.3%. In contrast, the differentiation by endometrial thickness as the sole criterion (cut-off point ≥5 mm) achieved a sensitivity of 97.9% and a specificity of 33.2%, with an accuracy of 52.3%. The combination of thickness with morphological features can be used in the diagnosis of benign and malignant endometrial disease with considerable accuracy in women with postmenopausal bleeding

- The use of TVS in the routine screening of postmenopausal women for endometrial disease is questionable when asymptomatic with a very low sensitivity (50%) and PPV (20%) though there was a high NPV (96.7%).B Greber et al(2001) in their study (56) aimed to investigate whether endometrial carcinoma screening by transvaginal sonography has a prognostic advantage over symptomatic women. They established that endometrial screening often results in unnecessary operations, which are associated with increased morbidity and costs. PMB was significantly associated with carcinoma. The bleeding time of symptomatic patients strongly correlated with the tumour stage. There is no prognostic advantage for screened compared with symptomatic patients.

Summary

SUMMARY

- A total of 105 postmenopausal women were involved in the study carried out from April 2008 to September 2009 at the Institute of Obstetrics and Gynaecology, MMC.
- TVS was done followed by histopathological diagnosis was made which was considered the gold standard.
- Age of women ranged from 42 to 73 years with 45% between 50 to 60 years.
- Most of the women were within 10 years of attaining menopause.
- A total of 30.5% had associated diseases such as hypertension, diabetes and other carcinomas which were significantly associated with endometrial disease.
- BMI had no relation with endometrial disease.
- Of all women 66.7% had postmenopausal bleeding and the rest were asymptomatic.
- Postmenopausal bleeding and years of menopause had strong association with endometrial disease.
- Morphological features including the appearance, characteristics, margins, endometrial halo and endometrial thickness produced significant association with endometrial disease.
- The overall diagnostic accuracy of TVS was 86.7%.

- The overall sensitivity, specificity, positive predictive value and negative predictive values were 80.0%, 88.2%, 61.5% and 94.9%.
- The accuracy of diagnosis was better in women with postmenopausal bleeding than those without bleeding.

Conclusions

CONCLUSIONS

- ✓ Transvaginal sonography is safe, simple, non invasive and cost effective in the diagnosis of endometrial disease.
- ✓ It can be used as the first line investigation in women with postmenopausal bleeding.
- ✓ A lesion if considered abnormal or suspicious can be further investigated and the mode of investigation can be decided based on findings.
- ✓ Use of saline infusion sonohysterography along with TVS can increase the accuracy of findings especially in diagnosing endometrial polyps.
- ✓ The combination of morphological features with endometrial thickness on gray scale ultrasound increases the diagnostic accuracy than with endometrial thickness alone.
- ✓ The routine use of TVS for screening of endometrial disease is not useful in postmenopausal women.

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Proforma

PROFORMA

Name: Age: IP number:

Occupation: Socioeconomic status:

Residential Address:

Age at menopause:

Do you have postmenopausal bleeding? Yes/No

If Yes
Time of onset
Duration of bleeding
Pattern of bleeding
Amount of bleeding
Any history of recurrent episodes

History of White discharge P/V Yes/ No
History of abdominal pain Yes/ No
History of any post coital bleeding Yes/ No
History of any urinary disturbance Yes/ No

Marital history:
Number of years since marriage:
Parity:
Total number of live children:
Age at first child birth:

Last child birth:

Abortions if any: Spontaneous /induced

History of any contraceptive use: Yes/No

If Yes- OCP/Intra uterine device/ barrier Methods/ Injectable or implant hormones/ tubectomy

Menstrual History:

Age at menarche:

Total number of years after menopause:

Nature of menopause- Gradual/ Stormy

History of any hormone replacement therapy: Yes/ No

If yes – number of years used/ using

Type of HRT

Indication

History of previous cycles: Regular/irregular

Length of cycles

Past History:

History of Any medical illness:

Essential Hypertension/ Diabetes mellitus/ Bronchial asthma/ Thyroid disorders/ Epilepsy/ Heart disease/ Tuberculosis/ bleeding disorders

If others specify:

Duration of disease:

Treatment taken:

History of carcinoma: Yes/No

If yes- Site

Type

Mode of treatment

History of surgeries in the past: Yes/ No

If yes- Type of surgery and indication

Family history:

History of Ovarian/ endometrial/ cervical/ Breast/ Gastrointestinal malignancies

If any others, specify

General examination:

Build: Nourishment:

Height: Weight: BMI:

Pulse rate: Blood Pressure:

Pallor/ Pedal edema/ Lymphadenopathy/ Clubbing

Thyroid and Breast examination:

Cardiovascular System: Respiratory System:

Per abdomen examination:

Local examination:

Per speculum examination:

Per vaginal examination:

Investigations:

- Urine routine
- Complete Haemogram
- Blood sugar
- Blood Urea
- Serum Creatinine
- Electrocardiogram(ECG)
- Chest X-ray PA view
- Trans vaginal Ultrasonography
- Trans abdominal ultrasound
- Endometrial histopathology

Abberviations

ABBREVIATIONS

PMB- Postmenopausal bleeding

TVS- Transvaginal sonography

USG- Ultrasonography

TAS- Transabdominal sonography

MRI-Magnetic resonance imaging

PPV- Positive predictive value

NPV- Negative predictive value

SIS- Saline infusion sonohysterography

BMI- Basal metabolic index

HPE- Histopathological examination

HRT-Hormone replacement therapy

CT- Computed Tomography

Master chart

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	S.no	NAME	AGE	IP no	MENOPAUSE	DISEASE	PARITY	BLEEDING	BMI	EM THICKNESS	APPERANCE	CHARECTERISTIC	Endometrial Halo	DIAGNOSIS	HPE
2	1	Elizabeth	48	16816	1	nil	2	yes	>25	5	homogenous	diffuse, regular	yes	thick	proliferative
3	2	Datchayini	49	6506	3	nil	2	no	<25	28	homogenous	focal, regular	yes	polyp	proliferative
4	3	Chandra	60	16533	15	nil	7	yes	<25	1	homogenous	thin line	yes	atrophic	atrophic
5	4	Subulakshmi	48	16791	3	nil	5	yes	<25	2	homogenous	thin line	yes	atrophic	proliferative
6	5	Kausalya	70	6521	20	HT	5	yes	>25	10	homogenous	diffuse, regular	yes	hyperplasia	simple hyperplasia
7	6	Lakshmi	60	3023	20	HT	7	no	<25	5	homogenous	diffuse,regular	yes	thick	atrophic
8	7	Esther	65	4863	17	nil	6	yes	<25	1	homogenous	thin line	yes	atrophic	atrophic
9	8	Thangama	70	4292	20	nil	0	yes	>25	3	homogenous	thin line	yes	atrophic	atrophic
10	9	Vennila	50	1291	1	nil	2	yes	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
11	10	Gowri	48	7863	2	nil	3	yes	<25	5	homogenous	thin line	yes	atrophic	atrophic
12	11	Vasantha	45	7846	2	nil	2	yes	>25	7	homogenous	diffuse, regular	yes	thick	proliferative
13	12	Vasantha	58	7999	16	HT	3	yes	<25	18	homogenous	focal, regular	yes	polyp	simple hyperplasia
14	13	Saratha	51	5567	5	nil	2	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
15	14	Padmavathy	49	5184	1	nil	4	yes	<25	3	homogenous	thin line	yes	atrophic	proliferative
16	15	Kuppama	53	5561	4.5	HT & DM	3	yes	>25	11	heterogenous	diffuse, irregular margin	no	endometriu	Ca endometrium Ic
17	16	Devakirbamani	52	9168	2	nil	3	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
18	17	Apoorvam	52	15525	4	nil	4	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
19	18	Lakshmi	45	14813	8	nil	3	yes	>25	6	homogenous	diffuse,irregular	no	endometriu	Ca endometrium Ic
20	19	Prema	44	16724	1	DM & anaemia	4	yes	<25	5	homogenous	diffuse, regular	yes	thick	proliferative
21	20	Kasthuri	55	16316	15	DM	4	yes	<25	9	homogenous	diffuse, regular	yes	thick	polyp
22	21	Kumari	45	17155	1	DM	4	yes	>25	8	homogenous	diffuse, regular	yes	thick	complex hyperplasia
23	22	Noor Bee	59	14109	12	HT & DM	6	yes	>25	9.5	heterogenous	diffuse,irregular	yes	endometriu	comp hyperplasia atypia
24	23	Rangamma	53	14075	7	nil	3	yes	<25	1	homogenous	thin line	yes	atrophic	atrophic
25	24	Saraswathy	55	13069	10	nil	5	no	>25	5	homogenous	diffuse, regular	yes	thick	senile cystic atrophy
26	25	Saratha	50	8069	1	DM	5	yes	>25	10	homogenous	diffuse, regular	yes	hyperplasia	simple hyperplasia
27	26	Vasanthi	50	9379	1.5	nil	2	yes	<25	3	homogenous	thin line	yes	atrophic	atrophic
28	27	Vasantha	46	19338	1	nil	3	yes	<25	9	homogenous	diffuse, regular	yes	thick	secretory
29	28	Senthamariamma	70	19306	26	nil	1	yes	<25	3	homogenous	thin line	yes	atrophic	atrophic
30	29	Ammaniammal	55	16774	10	nil	5	no	<25	6	homogenous	diffuse, regular	yes	thick	atrophic
31	30	Lakshmi	57	19354	11	Ca caecum	2	yes	<25	15	heterogenous	diffuse, irregular margin	no	endometriu	Ca endometrium II b
32	31	Kumari	45	19682	1	nil	3	yes	<25	3	homogenous	thin line	yes	atrophic	proliferative
33	32	Varalakshmi	55	17777	2	HT & DM	3	yes	>25	3	homogenous	thin line	yes	atrophic	atrophic
34	33	Chellamma	46	6814	5	nil	1	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
35	34	sulochana	50	1598	9	nil	3	no	<25	7	homogenous	diffuse, regular	yes	thick	proliferative
36	35	Akilandam	50	15224	1	nil	3	yes	<25	2	homogenous	thin line	yes	atrophic	proliferative
37	36	Saroja	50	12954	3	nil	4	no	<25	6	homogenous	diffuse, regular	yes	thick	atrophic
38	37	Nagammal	50	13575	5	nil	2	no	>25	7	homogenous	diffuse,regular	yes	thick	atrophic
39	38	Suriyagandhi	55	10524	15	HT	2	yes	>25	6	homogenous	diffuse, regular	yes	thick	senile cystic atrophy
40	39	Rani	51	11111	1	nil	3	no	<25	7	homogenous	diffuse, regular	yes	thick	simple hyperplasia
41	40	Chandra	55	12637	10	nil	4	yes	<25	2	homogenous	thin line	yes	atrophic	atrophic
42	41	Subheda bee	58	10203	6	HT	7	yes	>25	3	homogenous	thin line	yes	atrophic	atrophic
43	42	Manimegalai	45	12023	1	nil	2	no	<25	7	homogenous	diffuse, regular	yes	thick	proliferative
44	43	Rajalakshmi	57	6924	5	HT	3	yes	>25	15	heterogenous	diffuse, irregular margin	no	endometriu	Ca endometrium IIa
45	44	Nirmala	63	27889	16	nil	4	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
46	45	Krishnaveni	60	29475	10	nil	2	no	>25	6	homogenous	diffuse, regular	yes	thick	atrophic
47	46	Bagyalakshmi	58	28461	1	nil	2	yes	>25	8	homogenous	diffuse, regular	yes	thick	proliferative
48	47	Pachiammal	45	30671	1	nil	4	yes	<25	10	homogenous	diffuse, regular	yes	hyperplasia	proliferative
49	48	Govindamma	45	30672	1	nil	3	yes	<25	4	homogenous	thin line	yes	atrophic	proliferative
50	49	Jakubai	50	6712	1.5	nil	4	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
51	50	Ammni	48	21164	7	nil	3	no	<25	5	homogenous	diffuse, regular	yes	thick	proliferative
52	51	Thenjaiamma	55	20594	4	nil	4	no	<25	6	homogenous	diffuse, regular	yes	thick	senile cystic atrophy
53	52	Prema	48	30922	1	nil	4	yes	<25	10	homogenous	diffuse, regular	yes	hyperplasia	proliferative
54	53	Kasiammal	51	30321	3	HT	3	yes	>25	8	homogenous	diffuse, regular	yes	thick	proliferative

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
55	54	Maragatham	50	30321	2	nil	0	yes	>25	17	homogenous	diffuse, regular	no	hyperplasia	polyp
56	55	Mariamma	60	25168	5	nil	1	no	<25	8	homogenous	diffuse, regular	yes	thick	senile cystic atrophy
57	56	Karpagam	55	23430	10	DM	3	yes	<25	2	homogenous	thin line	yes	atrophic	atrophic
58	57	Aryammal	50	17385	4	nil	3	no	<25	11	heterogenous	diffuse, irregular margin	no	endometriu	proliferative
59	58	Pushpa	56	17747	12	nil	3	no	>25	5	homogenous	diffuse, regular	yes	thick	senile cystic atrophy
60	59	Bhaskaravalli	49	17446	1	nil	3	yes	>25	8	homogenous	diffuse, regular	yes	thick	proliferative
61	60	Valliammal	55	17732	10	nil	4	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
62	61	Sowbhagyam	42	16432	1	nil	1	yes	>25	7	heterogenous	focal, regular	yes	polyp	comp hyperplasia atypia
63	62	Devi	50	23562	1	DM	4	no	<25	8	homogenous	diffuse, regular	yes	thick	proliferative
64	63	Rajeshwari	55	23811	10	nil	4	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
65	64	Nageshwari	53	16154	1	HT	1	yes	>25	20	heterogenous	diffuse, irregular margin	no	endometriu	Ca endometrium IIa
66	65	Shanti	58	16814	10	nil	3	yes	>25	16	homogenous	diffuse, regular	yes	hyperplasia	proliferative
67	66	Grace	55	16623	3	HT	4	yes	>25	7	homogenous	diffuse, regular	yes	thick	atrophic
68	67	Munniamma	60	18368	8	HT	3	yes	>25	12	heterogenous	diffuse, irregular margin	no	endometriu	Ca endometrium IIb
69	68	Chinathai	55	14179	1	nil	3	yes	<25	7	homogenous	diffuse, regular	yes	thick	proliferative
70	69	Selvi	47	18374	2	nil	5	no	<25	7	homogenous	diffuse, regular	yes	thick	secretory
71	70	Shahida	48	18595	1	nil	4	no	>25	5	homogenous	diffuse, regular	yes	thick	proliferative
72	71	Kalaivani	52	17733	9	HT	3	yes	>25	10	homogenous	diffuse, regular	yes	hyperplasia	proliferative
73	72	Chaitini	58	17581	15	nil	3	yes	<25	6	homogenous	diffuse, regular	yes	thick	Ca endometrium Ic
74	73	Mala	43	17819	1	DM	3	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
75	74	Stella	52	17829	10	HT	5	yes	>25	4	homogenous	thin line	yes	atrophic	atrophic
76	75	Unnamalai	45	17909	6	nil	3	no	<25	6	homogenous	diffuse, regular	yes	thick	atrophic
77	76	Asmath	55	11997	10	DM	4	no	>25	5	homogenous	diffuse, regular	yes	thick	proliferative
78	77	Anjammal	50	19953	1.5	nil	3	yes	<25	5	homogenous	diffuse, regular	yes	thick	proliferative
79	78	Devakirba	53	11254	2	nil	2	yes	<25	7	homogenous	diffuse, regular	yes	thick	proliferative
80	79	Valarmathy	48	8623	1	nil	3	yes	<25	6	homogenous	diffuse, regular	yes	thick	proliferative
81	80	Kamala	55	11566	4	nil	3	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
82	81	Padmalayam	73	12158	20	Breast ca	4	no	<25	14	homogenous	diffuse, regular	yes	hyperplasia	simple hyperplasia
83	82	Achikannu	50	14351	3	nil	4	yes	>25	8	homogenous	diffuse, regular	yes	thick	proliferative
84	83	Mariammal	55	8654	8	nil	0	yes	<25	12	heterogenous	diffuse, regular	yes	hyperplasia	polyp
85	84	Pavalakodi	60	16211	5	nil	4	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
86	85	Amul	45	8690	2	nil	2	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic
87	86	Saroja	50	8867	10	nil	5	yes	>25	4	homogenous	thin line	yes	atrophic	atrophic
88	87	Meena	60	13456	6	nil	2	no	>25	6	homogenous	diffuse, regular	yes	thick	atrophic
89	88	Elakkal	70	4536	18	nil	4	yes	>25	2	homogenous	thin line	yes	atrophic	atrophic
90	89	Munniammal	49	3245	3	HT	5	no	<25	9	homogenous	diffuse, regular	yes	thick	proliferative
91	90	Santha	45	1785	2	DM	3	no	<25	6	homogenous	diffuse, regular	yes	thick	proliferative
92	91	Sivapoosam	53	1876	1	HT & DM	4	yes	<25	14	homogenous	diffuse, regular	yes	hyperplasia	complex hyperplasia
93	92	Radha	48	2345	3	nil	3	no	>25	7	homogenous	diffuse, regular	yes	thick	proliferative
94	93	Visalakshi	50	7654	7	nil	2	yes	>25	3	homogenous	thin line	yes	atrophic	atrophic
95	94	Anthoniammal	46	8765	2	nil	5	no	<25	5	homogenous	diffuse, regular	yes	thick	atrophic
96	95	Fariza Banu	56	5674	12	DM	7	yes	>25	2	homogenous	thin line	yes	atrophic	atrophic
97	96	Kuppu	45	14321	2	nil	5	yes	<25	10	homogenous	diffuse, regular	yes	hyperplasia	proliferative
98	97	Rajathi	60	12365	15	HT	4	yes	<25	13	homogenous	diffuse, regular	yes	hyperplasia	polyp
99	98	Ganga	53	5643	1.5	nil	1	no	<25	5	homogenous	diffuse , regular	yes	thick	senile cystic atrophy
100	99	Thanalakshmi	48	7654	4	nil	3	yes	<25	3	homogenous	thin line	yes	atrophic	atrophic
101	100	Jayamma	65	8452	12	HT	6	yes	<25	4	homogenous	thin line	yes	atrophic	senile cystic atrophy
102	101	Rani	62	6719	10	nil	0	yes	<25	7	homogenous	diffuse, regular	yes	thick	atrophic
103	102	Barani	46	12867	2	nil	2	no	>25	11	homogenous	diffuse, regular	yes	hyperplasia	proliferative
104	103	Sarasu	51	8790	2	nil	4	yes	>25	3	homogenous	thin line	yes	atrophic	atrophic
105	104	Kaveri	47	9231	3	nil	5	no	<25	6	homogenous	diffuse, regular	yes	thick	atrophic
106	105	Janakiammal	59	15321	9	nil	6	yes	<25	4	homogenous	thin line	yes	atrophic	atrophic