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# CORRELATION OF ENDOMETRIAL SAMPLING AND COLOUR DOPPLER USG DURING LUTEAL PHASE IN PRIMARY INFERTILITY

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## ABSTRACT
Infertility is a medical condition where multiple etiologies involving either female or male partner or both may be present. Synchronization is required between a healthy embryo and a receptive endometrium for occurrence of a successful pregnancy. To predict Uterine Receptivity accurately, the researchers have suggested a number of tests and endometrial biopsy being the first. But as endometrial biopsy is invasive, Doppler Ultrasonography has been proposed to predict quality of endometrium. The present study was conducted on 60 patients of primary infertility in reproductive age to correlate the histological findings of endometrial sampling with endometrial thickness, endometrial echogenecity and resistance of uterine blood flow by TVS USG Colour Doppler during luteal phase in the Department of Obstetrics and Gynaecology, Hindu Rao Hospital and NDMC Medical College, Delhi in close association with Department of Radiology and Pathology from August 2018 to April 2020.95% of the patients had regular menstrual cycle and 92% had normal duration of flow. 85% patients had no complaints associated with menstruation like Dysmenorrhea, Dyspareunia and lower abdominal pain and 88% had no acne or hirsutism. Maximum number of patients (50%) had infertility for 1-3 years. 66.7% showed Endometrial Thickness (ET) between 7-14 mm and the mean ET was 8.93 mm. On TVS the endometrium showed hyperechoic endometrium in 75% of patients which indicates luteal/ post ovulatory period of the menstrual cycle, 21.7% of patients showed hypoechoic endometrium, representing proliferative phase and only 3.3% showed isoecoic endometrium. 85% of the patients had PI of uterine artery was less than 3. There was no statistically significant correlation of histopathology of endometrium with endometrial thickness on TVS (p - value - 0.701). There was a statistically significant correlation between histological findings of endometrial biopsy and echogenicity of endometrium (p value <0.01) and histological findings of endometrium and PI of uterine artery (p value < 0.05) in our study. TVS Ultrasound can play a major role in diagnosis and management of cases presenting with primary infertility and should be used as first step diagnostic procedure in evaluation of infertility as OPD procedure instead of endometrial sampling. TVS can give information regarding texture of endometrium along with presence of any pelvic pathology in a single scan of few minutes and Colour doppler gives idea about vascular supply to the endometrium during midluteal phase.

***Keywords:*** *Endometrial Sampling, Endometrial Echogenecity, Endometrial Thickness, Luteal Phase Uterine PI*



## INTRODUCTION
Infertility is a medical condition where multiple etiologies involving either female or male partner or both may be present. The entire reproductive axis (hypothalamus, pituitary, ovary, fallopian tubes, uterus, cervix and vagina) must be intact and functional for female fertility. Disturbances involving any part of

genital system or parts of the central nervous system that control the ovaries hormonally may lead to female infertility (Shastrabudhe *et al*., 2001). The incidence of infertility varies from region to region and in India, about 15-20 million couple are infertile (Katole *et al*., 2019).

By Mahajan (2015) successful implantation requires a healthy embryo, a receptive endometrium, a synchronized and successful molecular dialogue between the two and immune protection from the host. A receptive endometrium develops when it undergoes precisely defined morphological changes under the effect of hormones (Hoozemans *et al*., 2004) and endometrial receptivity is ‘‘that period of endometrial maturation during which the trophectoderm of the blastocyst can attach to the endometrial epithelial cells and subsequently proceed to invade the endometrial stroma and vasculature’’ (Bassi, 2001). A receptive endometrium develops when it undergoes precisely defined morphological changes under the effect of hormones (Hoozemans *et al*., 2004). This makes endometrial sampling one of the most important investigations in infertility as it not only indicates hormonal response of endometrium but also gives information about other pathological lesions leading to infertility, e.g. atrophy, specific/ non specific infection like tuberculous endometritis and malignancies (Sahmay *et al*., 1995).

Various other techniques have been introduced to analyse endometrial function such as endometrial morphology by ultrasound, endometrial perfusion by endometrial Doppler studies, endometrial secretory function by biochemical assessment of serum and endometrial secretion (Strowitzki T *et al*., 2006). Trans vaginal sonography (TVS) is a non invasive modality which is used for assessing the cause of infertility by studying not only the pelvic anatomy but also the endometrial morphology which includes endometrial thickness and echogenicity. By TVS Colour Doppler variations in uterine perfusion can be studied during luteal phase. It has been demonstrated by Steer *et al*., (1995) that in normal fertile non pregnant women uterine artery impedance has its lowest value during the mid luteal phase of the menstrual cycle.

Ideally, a technique to assess endometrial function and thereby predict endometrial receptivity should be readily available during the daily routine clinical work. Very few Indian studies have been found in literature which compared endometrial sampling with TVS Colour Doppler Ultrasound for assessing the cause of infertility and so there is a need to compare the two modalities. The present study was undertaken in patients of primary infertility to study the endometrial thickness, endometrial echogenecity and resistance of blood flow during luteal phase of endometrial cycle by TVS Colour Doppler and to compare and correlate the histology of endometrial sampling during the same luteal phase with the TVS findings.

## MATERIALS AND METHODS

This was a tertiary care hospital based observational study conducted on cases of primary infertility of reproductive age group coming to Infertility Clinic, Department of Obstetrics and Gynaecology, Hindu Rao Hospital and NDMC Medical College, Delhi in close association with Department of Radiology and Pathology from August 2018 to April 2020. All females presenting with secondary infertility or with known endocrine, genetic disease or malformation of reproductive tract or not willing to participate in the study were excluded. Patients with leiomyoma or tubo ovarian mass were also excluded. A sample size of 60 patients presenting with Primary Infertility was taken with the help of statistician of the hospital at 5% type 1 error *($p<0.05$).* Sample size was calculated by using the following formula.

$$n \geq \frac{Z^2_{(1-(\alpha/2))} \times p(1-p)}{d^2}$$

The study participants were explained about the objectives and purpose of the study. A written informed consent was obtained and a detailed history was taken regarding: Age, Duration of active marital life, residential area and socioeconomic status according to Modified Kuppuswamy Scale, 2018 (Mohd Saleem, 2019). Coital history and a detailed menstrual history regarding frequency, regularity, duration of flow and volume of monthly blood loss was also taken according to FIGO, 2018 (Munro *et al.,* 2018). Other factors associated with menstruation like dysmenorrhoea, dyspareunia, lower abdominal pain were

taken into consideration. Any contraceptive history or past medical history of TB, Diabetes, STD or surgical history especially abdominal or pelvic surgery or any treatment taken for infertility was also noted. General physical examination was done and built of the patient, height, weight, BMI, pulse rate, blood pressure, respiratory rate, temperature, pallor, icterus, edema, and any lymphadenopathy were recorded. A thorough systemic examination was done to exclude any systemic disease as some of them might be directly responsible for changes in menstrual pattern. Abdomen was examined for any lump or tenderness. Per speculum examination was done to exclude any local pathology in vagina or cervix and bimanual examination was done to find out the size, shape, position, consistency, mobility, tenderness of uterus and its appendages in order to exclude any congenital malformation or tumour. Blood Investigations like Serum Thyroid Stimulating Hormone, Day 2 Luteinising Hormone, Day 2 Follicle Stimulating Hormone, Serum Prolactin in order to exclude any endocrine disorder were also done.

***Ultrasound examination***: A brief description regarding the process of transvaginal scanning was explained to the all the patients included in the study and a transvaginal sonography to visualize the pelvic structures in a systemic manner was done so that diagnostic error could be minimised. Endometrial thickness was measured and the endometrium was examined for echo-characteristic. Colour Doppler studies were done by trans-vaginal method using Mind-ray DC 60 Ultrasound machine with trans-vaginal probe. Uterine vessels were identified and a spectral trace was obtained from the selected vessel. The vascular pattern of uterine artery was assessed during systole and diastole and Pulsatility Index (PI) of the uterine artery was noted.

***Endometrial Sampling***: All patients included in this study were posted for endometrial sampling in premenstrual phase of their menstrual cycle. TVS Ultrasound was performed before taking endometrial biopsy in the same menstrual cycle.

The findings obtained from ultrasound and histopathology was grouped under following headings and was correlated.

***Endometrial Thickness***: <7 mm, 7-14 mm or > 14 mm:

***Echogenicity of the endometrium***: Isoechoic endometrium, Hypoechoic endometrium, or Hyperechoic endometrium: (Gonen *et al.*, 1990)

***Pulsatility Index of Uterine artery (PI)***: <3 or ≥3

Histopathological examination of Endometrial Biopsy was expressed as Proliferative, Secretory endometrium, Endometrial Hyperplasia or Endometritis (Acute, chronic non specific or tubercular) (Nandedkar *et al.*, 2014)

Results obtained were subjected for statistical analysis using appropriate software. Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Qualitative variables were correlated using Chi-Square test/Fisher's exact test. A p value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Privacy and confidentiality of each participant was assured. The study received ethical approval from the Institutional ethics committee.

## RESULTS

The age of 60 primary infertility cases in the present study ranged from 19-33 years. According to socioeconomic status most of cases were in Middle class (81.66%). 85% cases were residing in urban area of Delhi and 65% were either $12^{th}$ standard or graduate. 95% of the patients in our study had regular menstrual cycle and 8% had prolonged duration of menstrual flow. Figure 1 shows the distribution of patients according to factors associated with menstruation.

5% of patients in our study had a history of Tuberculosis in the past. Figure 2 shows the distribution of patients according to presence of complaints like acne and hirsuitism. Figure 3 and 4 show the

distribution of patients according to endometrial thickness and echogenicity of endometrium on TVS respectively. Figure 5 shows the distribution of patients according to Pulsatility Index of uterine artery on

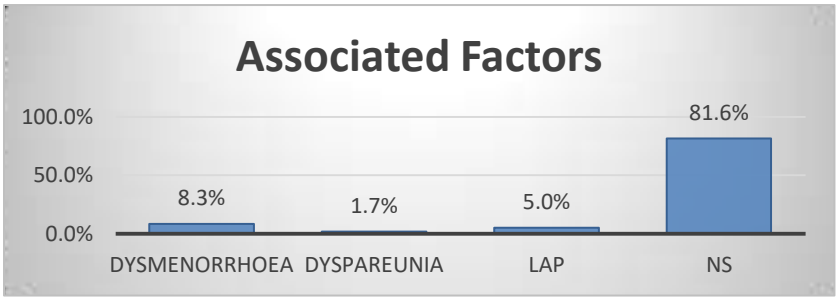


**Figure 1: Distribution of patients according to factors associated with menstruation**

TVS Colour Doppler. All the 60 patients in the study were posted for endometrial sampling in premenstrual phase of their menstrual cycle and table 1 shows the histopathology of endometrium. Table 2 shows the correlation of histopathology of endometrium with endometrial thickness on TVS in cases of Primary Infertility. There was no statistically significant correlation of histopathology of endometrium with endometrial thickness on TVS (p - value - 0.701). Table 3 and figure 6 shows the correlation histopathology of endometrial Sampling with echogenicity of endometrium by TVS. The patient showing simple hyperplasia on histopathology had endometrial thickness between 7-14 mm and hypoechoic endometrium on TVS. There was a strong statistically significant correlation of histopathology of endometrium with endometrial echogenicity on TVS (p - value < 0. 01). Table 4 and Figure 7 showed 70% of cases with proliferative endometrium on endometrial sampling had PI of uterine artery < 3, and 30% cases had PI >/=3. Those having secretory endometrium on endometrial sampling only 10.2% had PI of uterine artery >/= 3 whereas, 89.79% of them had PI < 3. PI of uterine artery was found to be >/= 3 in the patient who showed simple hyperplasia of endometrium on histological report. There was statistically significant correlation of histopathology of endometrium with Pulsatility Index of Uterine Artery on TVS (p - value - 0. 05).

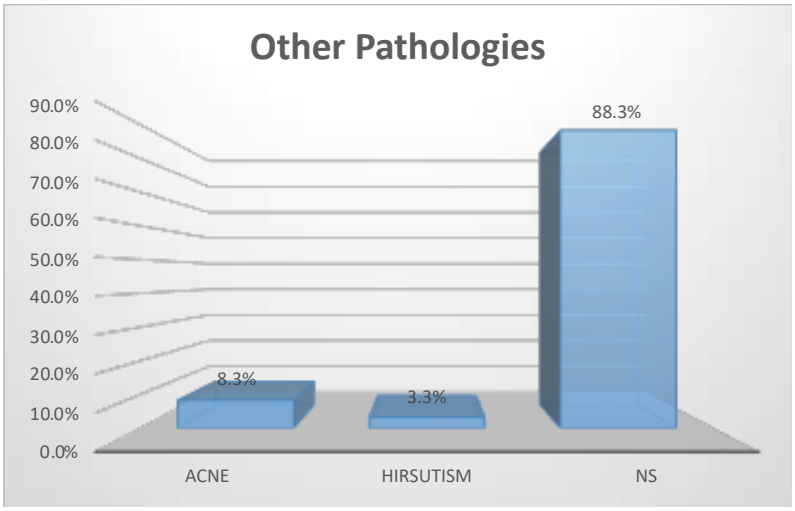


**Figure 2: Distribution of patients according to other clinical findings**

The present study was conducted to correlate the histological findings of endometrial sampling with endometrial thickness, endometrial echogenecity and resistance of uterine blood flow by TVS USG Colour Doppler during luteal phase in patients of Primary Infertility. It is well known that embryo cannot be implanted in a poorly matured endometrium and this inherent property of endometrium that decides the implantation of blastocyst is called Uterine Receptivity (Hoozemans *et al*., 2004). Receptivity of the endometrium is regulated by many factors like age, endocrine causes, inflammatory events and other local

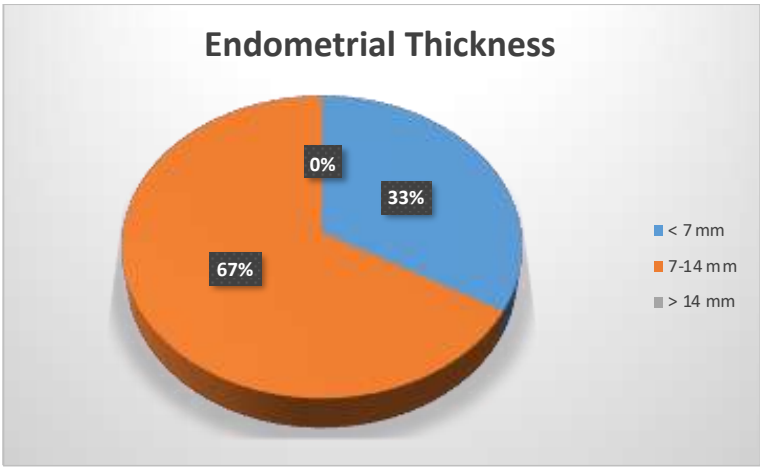


**Figure 3: Distribution of patients according to Endometrial Thickness**

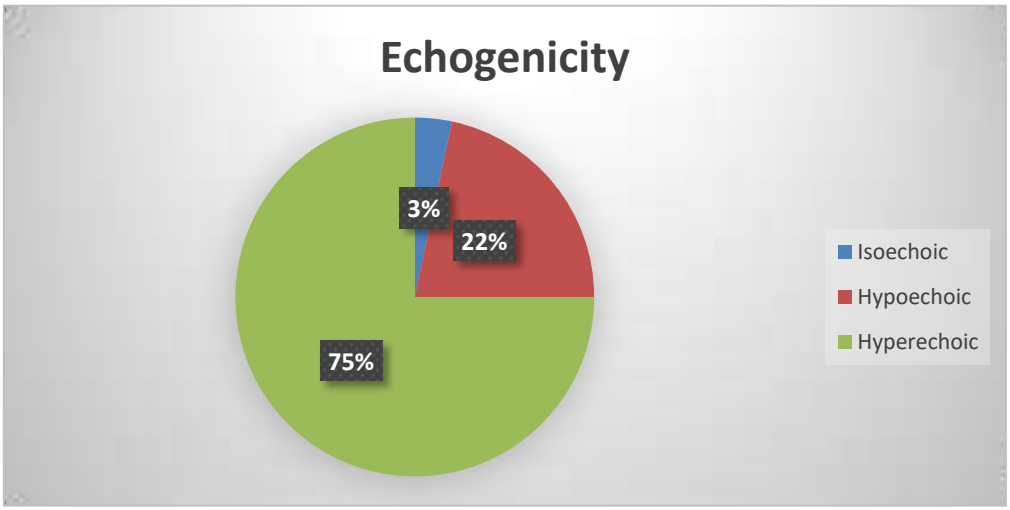


**Figure 4: Distribution of patients according to echogenicity of endometrium on TVS**

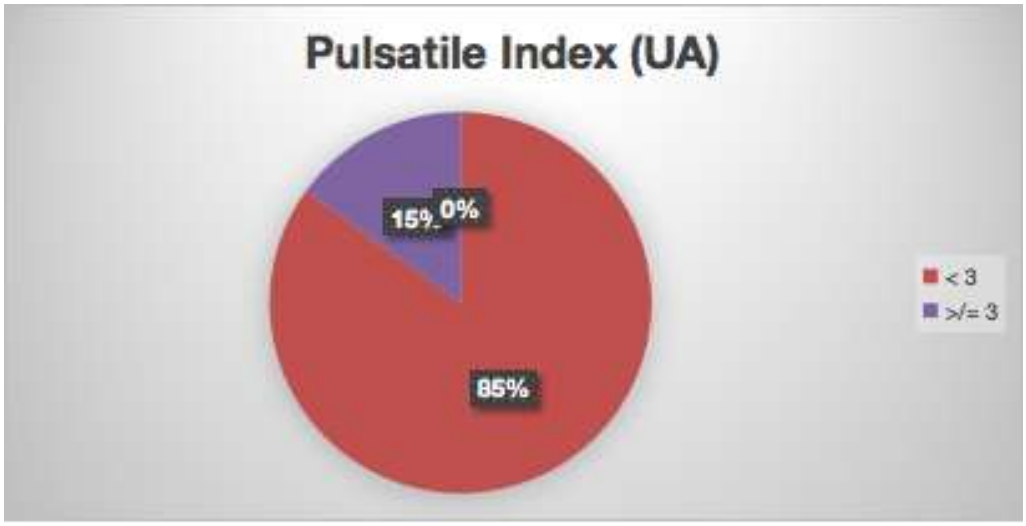


**Figure 5: Distribution of patients according to Pulsatility Index of Uterine Artery**

**Table 1: Distribution of patients according to Histopathology of Endometrial sampling**

| **Histopathology** | **Number (N=60)** | **Percentage (%)** |
|---|---|---|
| Proliferative | 10 | 16.7 |
| Secretory | 49 | 81.7 |
| Simple Hyperplasia | 01 | 1.7 |
| Tubercular / Acute Endometritis | 00 | 00 |
| Total | 60 | 100 |

**Table 2: Correlation of Histopathology on Endometrial sampling with endometrial thickness (TVS)**

| ***Histopathology*** | ***Endometrial thickness*** | | ***Total*** |
|---|---|---|---|
| | < 7 mm | 7-14 mm | |
| **Proliferative** | 4 | 6 | 10 |
| | 40% | 60% | 100% |
| **Secretory** | 16 | 33 | 49 |
| | 32.7% | 67% | 100% |
| **Simple Hyperplasia** | 0 | 1 | 1 |
| | 0.0% | 100% | 100% |
| **Total** | 20 | 40 | 60 |
| | 33.3% | 66.7% | 100% |
| **p - value - 0.701* | | | |

**chi-square test*

**Table 3: Correlation of Histopathology on Endometrial sampling with Echogenicity of Endometrium (TVS)**

| ***Histopathology*** | ***Echogenicity of endometrium*** | | | ***Total*** |
|---|---|---|---|---|
| | *Isoechoic* | *Hypoechoic* | *Hyperechoic* | |
| **Proliferative** | 2 | 6 | 2 | 10 |
| | 20.0% | 60.0% | 20.0% | 100.0% |
| **Secretory** | 0 | 6 | 43 | 49 |
| | 0.0% | 12.2% | 87.8% | 100.0% |
| **Simple Hyperplasia** | 0 | 1 | 0 | 1 |
| | 0.0% | 100.0% | 0.0% | 100.0% |
| **Total** | 2 | 13 | 45 | 60 |
| | 3.3% | 21.7% | 75.0% | 100.0% |
| **p- value <0.01* | | | | |

**chi-square test*

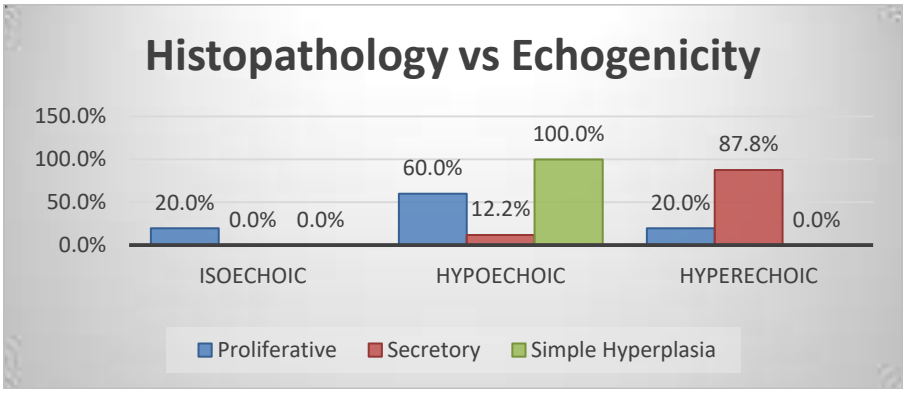


**Figure 6: Correlation of Histopathology on Endometrial sampling with Echogenicity of Endometrium (TVS)**

**Table 4: Correlation of Histopathology on Endometrial sampling and Pulsatility Index of Uterine Artery (TVS)**

| Histopathology | PI of Uterine artery | | Total |
|---|---|---|---|
| | < 3 | >/=3 | |
| Proliferative | 7 | 3 | 10 |
| | 70.0% | 30.0% | 100.0% |
| Secretory | 44 | 5 | 49 |
| | 89.79% | 10.2% | 100.0% |
| Simple Hyperplasia | 0 | 1 | 1 |
| | 0.0% | 100.0% | 100.0% |
| Total | 51 | 9 | 60 |
| | 85.0% | 15.0% | 100.0% |
| *p value < 0.05 | | | |

**chi-square test*

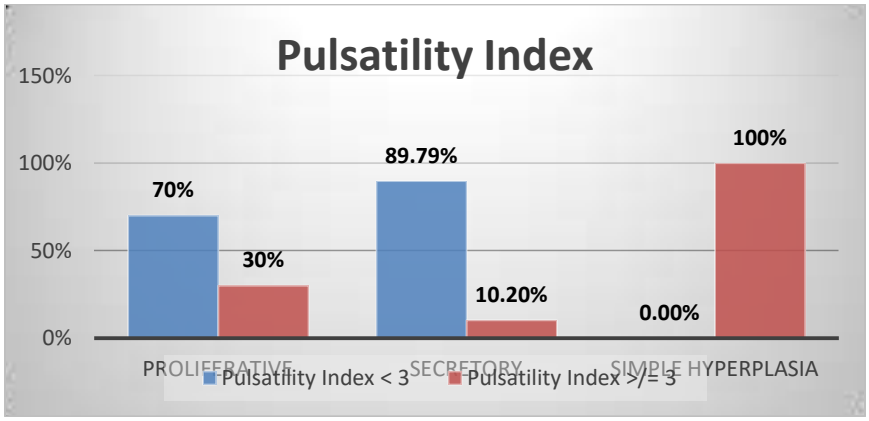


**Figure 7: Correlation of Histopathology on Endometrial sampling and Pulsatility Index of Uterine Artery (TVS Colour Doppler)**

## DISCUSSION

factors like endometrial thickness, endometrial volume, endometrial pattern including uterine perfusion (Fanchin, 2001). To predict Uterine Receptivity accurately and successfully the researchers have suggested a number of tests. At first, microscopic studies of endometrial biopsy was done. But as endometrial biopsy is an invasive and complex procedure and along with associated high chances of harm to the developing embryo in peri-ovulatory and mid luteal phase, Doppler Ultrasonography has been proposed to predict Uterine Receptivity (Bau *et al.,* 2008).

TVS Doppler Ultrasound helps to assess both the endometrial morphology as well as the status of uterine blood flow. Study of thickness, texture and perfusion of endometrium in cases of infertility during luteal phase of a natural menstrual cycle by TVS Doppler ultrasound along with comparison with endometrial sampling has been done by a very few researchers Ch. Sheethal (2016)**,** and our study is one of such study.

Maximum number of cases in our study were in age group 21 to 25 years (46.66% cases) followed by 26 to 30 years (41.66 % cases) and 31 to 35 years (6.66% cases). Similar results were seen in the study of Ch. Sheethal (2016) who found 56% of cases in age group 21-25 years followed by 25% in 26-30 years. In study by Nandedkar S*et al*., (2014), 41.39% cases were in age group 21-25 years, which is also similar to our study.

Majority of the cases belonged to Middle Class (81.66%) with maximum number of cases residing in urban area (85%) in our study. In contrast study by Ch. Sheethal (2016) showed that 50% cases were from Lower socioeconomic status. No one was illiterate in our study while in contrast in the study by Ch. Sheethal (2016), 59% cases were under graduate and 29% were illiterate. Our hospital is a tertiary care hospital in Delhi and most of the population is from urban area. It shows improved familiarity with and access to infertility services among educated patients and this account for greater use of medical resources.

Maximum number of patients (50%) had infertility for 1-3 years, 33.3% were infertile for 4-5 years and 16.7% of patients for more than 5 years. Ch. Sheethal (2016) showed that maximum number of patients in their study had infertility for 1-5 years (61%), 37% were infertile for 6-10 years while 16% for 16-20 years. Study by Nandedkar *et al*., (2014) showed that the maximum number of patients (39.3%) presented with infertility for 4-6 years.

In our study only 5% had irregular cycles and 8% suffered from prolonged duration of menstrual cycles along with excessive flow while in the study done by Ch. Sheethal (2016), 50% of cases had regular menstrual cycle. Polymenorrhoea was seen in 9%, Oligomenorrhoea in 10.5% of cases and 15% had menorrhagia in their study. Ovulatory dysfunction is very common cause of infertility (30-40%) and the patients may present with menstrual irregularity or amenorrhea. A normal menstrual cycle indicates normal HPA axis. Majority of patients in our study had normal regular menstrual cycle suggesting infertility due to factors other than ovulation dysfunction. Figure1 shows that 85% patients had no complaints associated with menstruation like dysmenorrhea, dyspareunia and lower abdominal pain. 8.3% of the patients in our study had complaints of acne while hirsutism was seen in 3.3% of cases. Thus most of the confounding factors in the study were absent.

5% of cases in our study had past history of Tuberculosis. 2 out of 3 patients (66.6%) with past history of Tuberculosis showed Hypoechoic endometrium on TVS USG and 33.3% had proliferative endometrium on endometrial sampling.

***Endometrium finding on TVS ultrasound and uterine flow doppler parameters:***

TVS Ultrasound was done in every patient before endometrial sampling and the endometrium was examined for its thickness and echogenicity and then uterine artery PI was measured. In our study, the endometrial thickness was measured through the central longitudinal axis of the uterine body. Figure 3 shows that most of the cases (66.7%) showed Endometrial Thickness (ET) between 7-14 mm while 33.3% had ET <7mm. The mean ET in our study was 8.93 mm. Our study is comparable to the study

conducted by Ch. Sheethal (2016)**.** In 37% of her cases endometrial thickness was in range of 9-12 mm followed by 34% in the range of 6-9mm. The mean endometrial thickness in her study was 9.9 mm. Zhang T *et al*., (2018) concluded in their study that, several sonographic parameters have been developed to predict endometrial receptivity, including endometrial thickness, endometrial pattern, endometrial volume, and endometrial and subendometrial blood flow and among these parameters endometrial thickness and endometrial pattern have been widely accepted as prognostic indicators for endometrial receptivity. However, there is still no consensus on whether the endometrial sonographic characteristics can predict the pregnancy outcome.

The sonographic appearance of endometrium showed hyperechoic endometrium in 75% of patients which indicates luteal/ post ovulatory period of the menstrual cycle, 21.7% of patients showed hypoechoic endometrium, representing proliferative phase and only 3.3% of our cases showed isoecoic endometrium (Figure 4). Our findings were similar to the study conducted by Ch. Sheethal (2016)**.** Hyperechoic endometrium was seen in 70% of cases and only 17% of cases showed hypoechoic endometrium. Rest 8% and 5% of her cases showed isoechoic and anechoic endometrium respectively. Lindhard A*et al***.,** (2006)in their study found hyperechogenic endometrium in 93% of cases and 7% of their cases showed hypoechogenic or isogenic endometrium.

In our study 85% of the patients had PI of uterine artery was less than 3, a fairly favorable feature indicating normal blood flow during both phases of the cardiac cycle. Only 15% cases showed PI of uterine artery >3 (Figure 5). Ch. Sheethal (2016), found PI > 3 in 8% of cases. She also reported that 56% of her cases showed PI in the range of 1-2 and 36% in the range of 2-3. Similarly, 40% of our patients showed PI in the range of 1-1.99 and 45% in range of 2-2.99. Razik M *et al*., (2014) concluded that unexplained infertility is associated with decrease uterine and ovarian blood flow during luteal phase and lesser chances of pregnancy.

***Endometrial pattern on histological examination of endometrial sampling:***

Maximum number of patients (81.7%) revealed normal secretory changes on histological examination. Proliferative changes were seen in 16.7% of patients and only 1.7% patients showed Simple Hyperplasia (Table 1). The study of Nandedkar *et al.,* (2014)showed secretory endometrium in 69.52% of cases, 27.60% of the cases showed proliferative endometrium. Endometritis was seen in 1.98% and hyperplasia in 0.90% of cases. Ch. Sheethal (2016) in her study reported that 69% of the cases had secretory endometrium, 28% cases showed proliferative endometrium, 0.01% had simple hyperplasia (0.01%), 0.015% showed tubercular endometritis and 0.005% showed benign cystic hyperplasia.

***Correlation of histopathology on endometrial sampling with endometrial pattern on TVS ultrasound:***

Out of 49 patients with secretory endometrium, 32.7% showed endometrial thickness of <7 mm and 67.3% patients showed endometrial thickness between 7-14 mm. Out of 10 patients with Proliferative endometrium on histopathology, 40% patients showed endometrial thickness <7 mm whereas in 60% the endometrial thickness was between 7-14 mm. There was no statistically significant correlation of histopathology of endometrium with endometrial thickness on TVS (p - value - 0.701) in our study (Table 2). Wu Y *et al*., (2014) found that patients with endometrial thickness between 7-8 mm had decreased pregnancy rate, but no significant difference was shown when compared to patients with endometrial thickness in 8-14 mm. They concluded that implantation rate was significantly lower in patients with thin endometrial compared to thick endometrium. Liu *et al*., (2019) also concluded that endometrial thickness in range of 10.5 - 13.9 mm was associated with significantly higher conception rates and a trend towards higher clinical pregnancy rates. No pregnancy was found in patients with ET <5mm or >15mm.

In our study there was a significant correlation (p value <0.01) between histological findings of endometrial biopsy and echogenicity of endometrium by TVS Ultrasound. Out of 10 patients with Proliferative endometrium on histopathology, 60% showed Hypoechoic endometrium on TVS Colour Doppler USG whereas, 20% showed Hyperechoic endometrium and another 2 patients (20%) showed Isoechoic endometrium on TVS Ultrasound. Out of 49 showing Secretory Endometrium 87.8%, showed Hyperechoic endometrium and 12.2% showed Hypoechoic endometrium on TVS Ultrasound. The endometrial thickness and echogenecity keeps on changing throughout the cycle and during secretory phase the endometrial lining is thick and hyperechoeic. Ch. Sheethal (2016) in her study reported that out

of 118 cases of secretory endometrium 95% were either hyperechoiec or isoechoeic. Gonen *et al.,* (1990**)** studied the endometrial texture and thickness during ovulation induction for IVF and found that triple-line endometrium was more likely to be associated with successful implantation. They also stated that due to orderly organisation of glandular elements in proliferative phase, endometrium is generally hypoechoic in this phase, with a well defined central line, whereas the endometrium is usually hyperechoic in secretory phase of the menstrual cycle with non visualisation of central line. Check *et al.,* (2003) found significantly higher pregnancy rates in the group with a mid-luteal phase homogenous hyper echogenic pattern compared with a non-homogenous pattern. This indirectly signifies that homogenous hyper echogenic pattern correlates with secretory endometrium. Thus ultrasonographic texture of the endometrium may have a greater prognostic value for implantation.

***Correlation of histopathology on endometrial sampling with uterine blood flow on TVS Colour Doppler:***

Histopathology on endometrial sampling and PI of uterine artery has shown a statistically significant correlation (p value < 0.05) in our study. When uterine PI was < 3 then 86% cases had secretory endometrium on endometrial sampling while in cases with uterine PI > 3, proliferative endometrium or hyperplasia was noted in 44.5% cases. Changes in endometrial vascularity appear on Colour Doppler examination which may reflect the histologic findings present in the endometrial biopsy. In general uterine PI decreases during the secretory phase because of increased diastolic flow within the corpus luteum (Zalud *et al*., 1990). Higher PI is typical in the late secretory and menstrual phases with intermediate values during follicular phase. Lilic *et al.,* (2007) observed that good flow in uterine vessels, are necessary for good pregnancy rates or indirectly secretory endometrium. Steer *et al*., (1995) reported that 35% of women who failed to conceive in an IVF program had a mean uterine artery PI values >3.0. These studies give correlation of PI with uterine receptivity and pregnancy rate and indicate that the Colour Doppler Ultrasound findings correlate and reflect the histology of endometrium.

Though endometrial sampling shows response of the endometrium to different hormones and provides information regarding the local factors but the main disadvantage associated with it is that it being invasive may lead to disruption of any ongoing pregnancy or bleeding at the implantation site. It does not provide any information about myometrial and adenexal pathologies or any vascular changes. Moreover, the result of this procedure is not immediately available. TVS Ultrasound Color Doppler on the other hand can give information regarding various pelvic pathologies in a single scan of few minutes. It also gives idea about vascular supply to the endometrium affecting endometrial receptivity.

## CONCLUSION

Most of patients with secretory endometrium show hyperechoic endometrium on TVS whereas, most of the patients who have proliferative endometrium on endometrial sampling show hypoechoic endometrium. The Colour Doppler Ultrasound findings correlate and reflect the histopathological findings of the endometrium. Uterine PI decreases during the secretory phase (usually <3). Thus, we can say that TVS Ultrasound can play a major role in diagnosis and management of cases presenting with primary infertility. It may be used as first step diagnostic procedure in evaluation of infertility as it is a non invasive OPD procedure, not requiring full bladder and has a greater patient compliance which can be used to study endometrium and its changes in detail and fairly accurately.

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