

Is Endometrial Thickness Is A Predictor Of Infertility?

Syed Muhammad Yousaf Farooq¹, Zareen Fatima¹, Asif Hanif¹, Muhammad Abdul Hannan¹, Syed Amir Gilani¹, Syeda Khadija tul Sughra¹

¹University Institute of Radiological Sciences and Medical Imaging Technology, Faculty of Allied Health Sciences, the University of Lahore.

Corresponding Author: Syed Muhammad Yousaf Farooq

Email: Yousafgelani@gmail.com

DOI: 10.47750/pnr.2022.13.510.663

Abstract

Background: Infertility remains a great social, economic and social problem since long. The specialist and experts of every field contribute their part to either reduce its unfavorable outcomes or cure it. In such situation the experts of ultrasound also put forward their services to find solution for this great problem. With the advent of ultrasound now it is too easy to observe uterus, ovaries, and endometrium etc. As endometrium is under the hormone activities and prepare for the implantation zygote and if not prepared remain deprived of implantation. This research is therefore trying to the evaluate the role of endometrium in infertility.

Objective: To find if endometrial thickness at proliferative phase is a predictor of infertility.

Material and methods: It was Cross sectional analytical study conducted at University Ultrasound clinic, Green town Lahore and Gilani Ultrasound Center, Lahore for the duration of 9 months. 170 females were included. Convenient sampling technique was used. Group I: All the married infertile females in proliferative phase. Group II: All married fertile females in proliferative phase. All married infertile females with any abnormality were excluded.

Results: The infertile group has a mean endometrial thickness of 4.9875 mm with a standard deviation of 1.36404 mm, while the fertile group has a mean endometrial thickness of 7.2111 mm with a standard deviation of 2.07984 mm. Results suggest that the endometrial thickness between the fertile and infertile groups appears to be considerably different, with the fertile group having a thicker endometrium than the infertile group.

Conclusion: Study concluded that the thin endometrium is less favorable to implantation than thick endometrial. These findings suggest that endometrial thickness is an important factor in fertility, and that individuals with thinner endometrial linings may have a higher risk of infertility.

Keywords: Infertility; Endometrial thickness; Fertility, Primary Infertility, Secondary Infertility.

INTRODUCTION

Infertility is defined as a year of no conception with exposed sexual activity within the menstrual cycle's ovulation cycle^{1,2}. Both men and women who are infertile have reported about being depressed, helpless, and under stress in their marriages. Women are 2-3 times as likely than males to experience major depression associated with infertility.^{3,4} According to the WHO infertility is defined clinically as "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse,"⁵ The 12-month prevalence in developing countries ranges from 6.9% to 9.3%. There are substantial regional differences, and these variations can be largely attributed to various environmental, cultural, and socioeconomic factors.^{6,7} Overall, it was found that 10.1% of males and 12.5% of women have infertility.⁸ Population of Pakistan's is growing rapidly, its

infertility rate is 21.9% (primary 3.5% and secondary 18.4%), despite the country's population growth rate being around 2%.⁹ There are many reasons for infertility, but the most common are issues with ovulation (tumors /cysts, use of different medications, hormone imbalance, thyroid gland disorders, stress, obesity), and extreme exercise. Endometrial thickness and patterns were two key anatomical factors that were recommended to be estimated by ultrasonography, where the uterine cavity is shown by a prominent bright line and the outer lines indicate the endometrium's basal layer. The functional layer of the endometrium may be indicated by the hypo-echogenic patches that run between the two outer lines and the central line.¹⁰ These patients' endometrial characteristics, such as endometrial thickness, endometrial layering, and endometrial blood flow, were seen sonographically during the usual mid-cycle.¹¹ In the phase of proliferation, the endometrium's normal thickness increases as a result of estrogen. The endometrium creates an attachment site for the first embryos until the placenta develops after ovulation. As a result, the endometrium's development during the follicular phase presents significant risks to the uterus' ability to function as a reproductive organ.^{12,13}

This study aimed to evaluate the association between endometrial thickness and infertility. Deficient endometrial thickness is one of the many causes of infertility. The research aims to compare endometrial thickness with infertility to highlight the potential role of deficient endometrial thickness in infertility.

MATERIALS AND METHODS

It was Cross sectional analytical study conducted at University Ultrasound clinic, Green town Lahore and Gilani Ultrasound Center, Lahore for the duration of 9 months. 170 females were included. Convenient sampling technique was used. Group I: All the married infertile females in proliferative phase. Group II: All married fertile females in proliferative phase. All married infertile females with any abnormality were excluded. Toshiba Xerio with convex transducer, frequency ranging 3-6 MHZ with color, power and pulsed Doppler. Informed consent was obtained from all the patient after explaining the entire procedure and benefits to them. While following the AIUM-guidelines for obstetrical and gynecological Ultrasound, all the patients were scanned trans abdominally with full urinary bladder. Optimum image resolution was obtained with the adjustment of settings. The maximum endometrial thickness was measured in long axis view. Data was evaluated and analyzed with SPSS version 25. The quantitative data (Age, endometrial thickness) are presented in the form of descriptive statistics, mean \pm S.D, and qualitative data like fertility and infertility are presented by percentage, frequency, whisker box plot and bar charts or pie charts. Independent t-test was applied to find the association between endometrial thickness and infertility.

RESULTS

Mean age was 31.26 ± 5.64 years. The mean value of day of menstrual cycle was 12.59 ± 3.50 and mean of endometrial thickness was 6.16 ± 2.09 mm.

Table 1: Mean and standard deviation of endometrial thickness in fertile and infertile females.

| Group Statistics | | | | | |
|---------------------------|-----------------------|----|--------|----------------|-----------------|
| | Infertility/fertility | N | Mean | Std. Deviation | Std. Error Mean |
| Endometrial thickness(mm) | Infertile | 80 | 4.9875 | 1.36404 | .15250 |
| | Fertile | 90 | 7.2111 | 2.07984 | .21923 |

The infertile group has a mean endometrial thickness of 4.9875 mm with a standard deviation of 1.36404 mm, while the fertile group has a mean endometrial thickness of 7.2111 mm with a standard deviation of 2.07984 mm.

Table 2: Independent sample t-test for endometrial thickness and infertility.

Independent Samples Test

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---------------------------|-----------------------------|---|------|------------------------------|---------|-----------------|-----------------|-----------------------|---|----------|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Endometrial thickness(mm) | Equal variances assumed | 10.029 | .002 | -8.132 | 168 | .000 | -2.22361 | .27343 | -2.76342 | -1.68381 |
| | Equal variances not assumed | | | -8.326 | 155.067 | .000 | -2.22361 | .26706 | -2.75116 | -1.69607 |

Results suggest that the endometrial thickness between the fertile and infertile groups appears to be considerably different, with the fertile group having a thicker endometrium than the infertile group.

Table 3: Mean and SD of endometrial thickness in primary and secondary infertility/

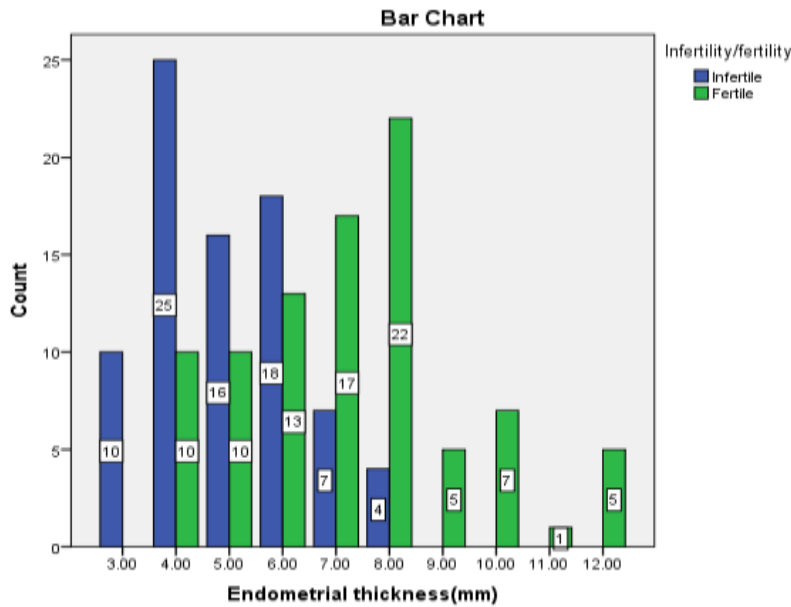
Report

Endometrial thickness(mm)

| Infertility/fertility | Mean | N | Std. Deviation |
|-----------------------|--------|-----|----------------|
| fertile | 7.2111 | 90 | 2.07984 |
| primary infertility | 4.9107 | 56 | 1.26888 |
| secondary infertility | 5.1667 | 24 | 1.57885 |
| Total | 6.1647 | 170 | 2.09450 |

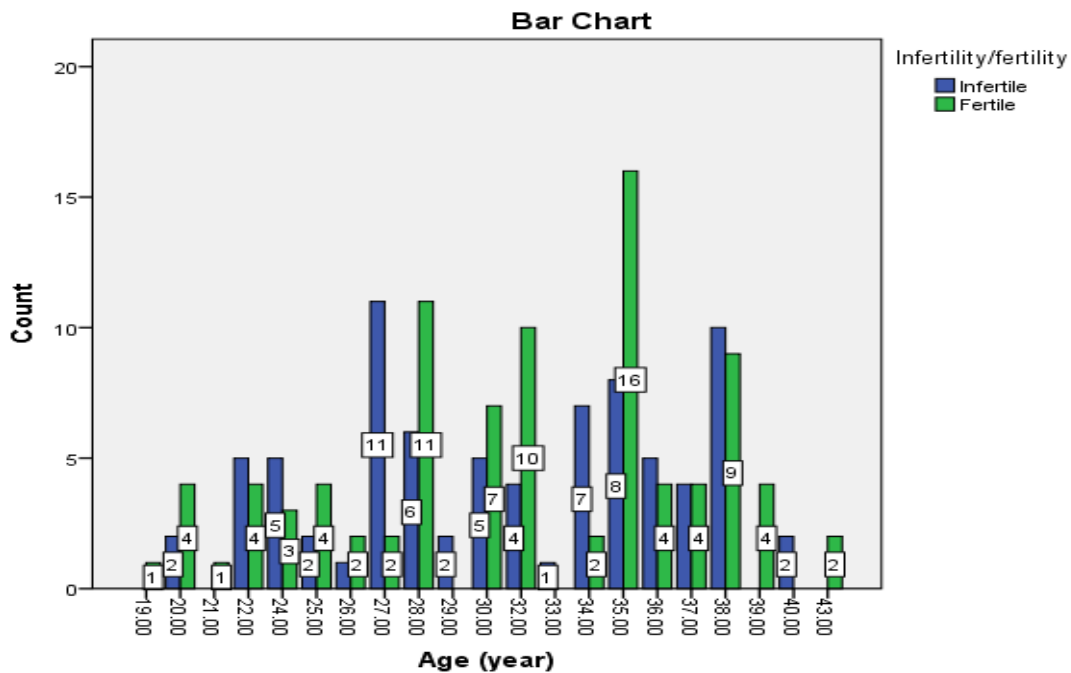
The fertile group has a mean endometrial thickness of 7.2111 mm with a standard deviation of 2.07984 mm, based on a sample size of 90 individuals. The primary infertility group has a lower mean endometrial thickness of 4.9107 mm with a standard deviation of 1.26888 mm, based on a sample size of 56 individuals. The secondary infertility group has a slightly higher mean endometrial thickness of 5.1667 mm with a standard deviation of 1.57885 mm, based on a smaller sample size of 24 individuals.

Figure 1: Bar chart between endometrial thickness and fertility/infertility



According to the bar chart, the majority of individuals with endometrial thickness between 4mm and 8mm are fertile. Specifically, there are 35 individuals with endometrial thickness of 4mm, 5mm, 6mm, or 7mm who are fertile.

Figure 2: Bar chart between age and fertility/infertility



With a mean age of 31.25 years and a standard deviation of 5.64 years, the majority of participants are between the ages of 28 and 35. It can also be seen that the highest number of fertile participants falls in the age group of 28 to 30 (years), with 10 and 11 participants respectively. On the other side, the age groups of 27–28 and 38–39 have the highest proportion of infertile participants, with 11 and 10, respectively.

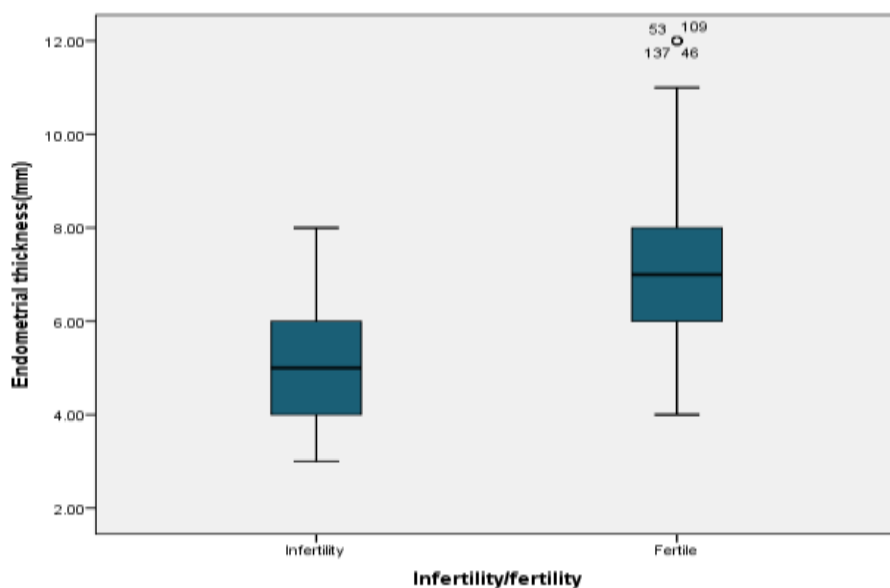


Figure 3: Comparison of the mean of endometrial thickness infertility and fertile women.

DISCUSSION

The present study aimed to investigate the relationship between endometrial thickness and infertility. Results showed that there is a significant difference in mean endometrial thickness between the fertile and infertile groups, with the fertile group having a thicker endometrium. These findings are consistent with previous research that has demonstrated the importance of endometrial thickness in fertility. A systematic review and meta-analysis by Kasius et al. (2018) found that there is a positive association between endometrial thickness and pregnancy rates in in vitro fertilization (IVF) cycles.¹⁴ Another study by Zhang et al. (2016) reported that individuals with endometrial thickness below 7 mm had a significantly lower pregnancy rate compared to those with thicker endometrium.¹⁵

A study conducted by Acharya et al. (2014) studied the relation between endometrial thickness and fertility in women with polycystic ovary syndrome (PCOS). The study found that endometrial thickness was significantly associated with pregnancy outcomes in women with PCOS.¹⁶ In a study by Maged et al. (2015), endometrial thickness was found to be a predictor of pregnancy outcomes in women undergoing assisted reproductive technology (ART). The study found that thicker endometrium was associated with higher pregnancy rates.¹⁷ In a retrospective cohort study by Park et al. (2016), endometrial thickness was found to be a significant predictor of clinical pregnancy and live birth rates in women undergoing frozen-thawed embryo transfer cycles.¹⁸ Another study conducted by Bu et al. (2017) studied the relation between endometrial thickness and pregnancy outcomes in women undergoing IVF-ET cycles. The study found that thicker endometria were associated with higher pregnancy rates.¹⁹ A retrospective cohort study by Huang et al. (2017) found that endometrial thickness was significantly associated with pregnancy outcomes in women undergoing frozen-thawed embryo transfer cycles.²⁰ In a study by Zhang et al. (2018), endometrial thickness was found to be a predictor of pregnancy outcomes in women undergoing frozen-thawed embryo transfer cycles. The study found that thicker endometrium was associated with higher pregnancy rates.²¹ Li et al. 2019 conducted the study between endometrial thickness and pregnancy outcomes in women undergoing IVF-ET cycles. The study found that thicker endometrium was associated with higher pregnancy rates.²²

Overall, the findings of the present study are consistent with previous research that has demonstrated a significant association between endometrial thickness and fertility outcomes. In conclusion, the present study provides evidence for a significant interaction effect between endometrial thickness and infertility. These findings suggest that endometrial thickness is an important factor in fertility and may be a useful predictor of pregnancy outcomes.

However, further research is needed to explore the specific nature of this interaction and to identify other factors that may influence fertility.

CONCLUSION

Study concluded that there is a significant difference in mean endometrial thickness between the fertile and infertile groups, with the fertile group having a thicker endometrium. Thick endometrium has high receptivity rate as compared to thin one. The mean endometrial thickness of fertile endometrium was greater than the mean thickness of infertile endometrium. However, overall, these findings suggest that endometrial thickness is an important factor in fertility, and that individuals with thinner endometrial linings may have a higher risk of infertility.

REFERENCES

1. Ombelet W, Cooke I, Dyer S, Serour G, Devroey P. Infertility and the provision of infertility medical services in developing countries. *Human reproduction update* 2008;14(6):605-21.
2. Patel M. The socioeconomic impact of infertility on women in developing countries. *Facts, views & vision in ObGyn* 2016;8(1):59.
3. Al-Homaidan HT. Depression among women with primary infertility attending an infertility clinic in Riyadh, Kingdom of Saudi Arabia: rate, severity, and contributing factors. *International journal of health sciences* 2011;5(2):108.
4. Engler N. The psychological impact of infertility and its treatment. *Harvard Mental Health Letter* 2009;25(11):1-3.
5. Pasch LA, Sullivan KT. Stress and coping in couples facing infertility. *Current opinion in psychology* 2017;13:131-5.
6. Abbey A, Andrews FM, Halman LJ. Gender's role in responses to infertility. *Psychology of women Quarterly* 1991;15(2):295-316.
7. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Human reproduction* 2007;22(6):1506-12.
8. Datta J, Palmer M, Tanton C, Gibson L, Jones K, Macdowall W, et al. Prevalence of infertility and help seeking among 15 000 women and men. *Human Reproduction* 2016;31(9):2108-18.
9. Zaidi N, Tahir F, Subhan F, Sultan S, Deepa F, Qayyum M, et al. Evaluation of serum testosterone level among Pakistani women with a history of infertility. *Pak. J. Med. Res* 2004;43:19-21.
10. Forrest T, Elyaderani M, Muilenburg M, Bewtra C, Kable W, Sullivan P. Cyclic endometrial changes: US assessment with histologic correlation. *Radiology*. 1988;167(1):233-7.
11. Gnoth C, Frank-Herrmann P, Freundl G. Opinion: natural family planning and the management of infertility. *Archives of gynecology and obstetrics*. 2002;267(2):67-71.
12. Rashidi BH, Sadeghi M, Jafarabadi M, Nejad EST. Relationships between pregnancy rates following in vitro fertilization or intracytoplasmic sperm injection and endometrial thickness and pattern. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2005;120(2):179-84.
13. Laasch C, Puschek E. Cumulative embryo score, not endometrial thickness, is best for pregnancy prediction in IVF. *Journal of Assisted Reproduction and Genetics*. 2004;21(2):47-50.
14. Kasius, A., Smit, J. G., Torrance, H. L., Eijkemans, M. J., Mol, B. W., Opmeer, B. C., & Broekmans, F. J. (2018). Endometrial thickness and pregnancy rates after IVF: a systematic review and meta-analysis. *Human Reproduction Update*, 24(4), 441-458.
15. Zhang, X., Chen, C. H., Confino, E., Barnes, R. B., Milad, M., Kazer, R. R., & Maurer, R. (2016). Increased endometrial thickness is associated with improved treatment outcome for selected patients undergoing in vitro fertilization-embryo transfer. *Fertility and Sterility*, 105(6), 1602-1608.
16. Acharya, K., Acharya, L., Sharma, N., & Sharma, U. (2014). Role of endometrial thickness as a predictor of pregnancy outcome in polycystic ovarian syndrome. *Journal of clinical and diagnostic research: JCDR*, 8(9), OC01-OC03.
16. Maged, A. M., Altraigey, A., Sayed, A. M., & Mohsen, I. A. (2015). Endometrial thickness as a predictor of pregnancy outcomes in 1078 women undergoing assisted reproductive technology. *Journal of gynecology obstetrics and human reproduction*, 44(5), 275-280.
17. Park, H. J., Park, C. W., Kim, H. J., Yang, K. M., Song, I. O., & Lim, K. T. (2016). Endometrial thickness and pregnancy outcome after thawed embryo transfer cycles: a retrospective cohort study. *Journal of assisted reproduction and genetics*, 33(7), 889-895.
18. Bu, Z., Dai, W., Xu, Y., Li, H., & Zhang, X. (2017). The thickness of endometrial and subendometrial blood flow are correlated with the pregnancy rate of in vitro fertilization and embryo transfer in patients with adenomyosis. *Gynecological endocrinology*, 33(2), 145-148.
19. Huang, B., Li, Z., Zhang, H., Li, Y., Zhang, J., & Cai, L. (2017). Endometrial thickness as a predictor of the reproductive outcomes in fresh and frozen embryo transfer cycles: a retrospective cohort study of 1512 IVF cycles with morphologically good-quality blastocyst. *Medicine*, 96(46), e8525.
20. Zhang, X., Zhang, S., Yang, Y., Chen, X., Huang, H., & Liu, P. (2018). Effect of endometrial thickness on pregnancy outcomes in frozen embryo transfer cycles: an analysis of 8,267 cycles. *Journal of assisted reproduction and genetics*, 35(11), 2017-2026.

21. Li, H. W., Lee, V. C., Lau, E. Y., Yeung, W. S., & Ho, P. C. (2019). Endometrial thickness measurement revisited: the impact on ART outcomes in the modern era. *Human reproduction open*, 2019(3), hoz011.