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PREVALENCE OF HYPOTHYROIDISM IN INFERTILE WOMEN POPULATION- A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Infertility is often seen in women who experience ovulatory dysfunction due to hypothyroidism, which is the most common endocrine issue. Subclinical hypothyroidism (SCH), a milder form of the condition, is characterized by slightly Abnormal levels of Thyroid Stimulating Hormone and normal levels of Free tetraiodothyronine (T4) can disrupt reproductive functions. **Objective:** Our study aimed to evaluate the % prevalence of hypothyroidism in primary and secondary infertile women. **Methodology:** This is a prospective observational study conducted in the Obstetrics and Gynecology Out Patient Department at Shadan Institute of Medical Sciences Teaching Hospital and Research Centre, Hyderabad, Telangana from 2023-2024 for 6 months. The study enrolled 100 women who were infertile and between the ages of 18 and 45. These women were attending the Out Patient Department for medical care. Cases were selected using a systematic random sampling technique. Patient demographic information (age, weight, blood pressure, etc.), presenting complaints, Gynecological history (past history, last menstrual

period, menstrual history, coital history, surgical history, etc.), and laboratory investigations (complete blood picture, Thyroid Profile, Prolactin, Blood sugar) were gathered. **Result:** The % prevalence of hypothyroidism was 17% among the infertile patients attending the Out Patient Department. In our study, out of the total of 100 cases, 73 were primary infertile and 27 were secondary infertile. Among 73 primary infertile women, 15 were suffering from hypothyroidism and only 2 hypothyroid cases were found in secondary infertile women. Among the 17 hypothyroid patients, 10 had subclinical hypothyroidism and the remaining 7 had clinical hypothyroidism. The highest number of infertile patients was found in the age group of 25-30 that is 37 patients. **Conclusion:** In a sample of 100 women who had experienced at least one year of infertility, it was found that 17% of them suffered from Hypothyroidism. Hypothyroidism can be a prominent cause of infertility. Infertile women frequently suffer from hypothyroidism, which can be a contributing factor to their infertility. Further studies are warranted to enhance our comprehension of this condition and improve healthcare delivery.

KEYWORDS: Infertility, Hypothyroidism, Thyroid Stimulating Hormone, Prolactin, Subclinical Hypothyroidism, Clinical Hypothyroidism.

INTRODUCTION

Infertility

The condition of infertility is characterized by the inability to achieve pregnancy even after engaging in unprotected sexual activity for a year.[2] Infertility is a complex condition that has far- reaching implications on an individual's physical, emotional, and financial well-being.[1]

The following are the most frequently identifiable factors of female infertility

25% of infertility cases are caused by ovulatory disorders, while endometriosis accounts for 15%, an adhesion in the pelvis for 12%, obstruction of the tubules for 11%, and 11% had other uterine or tubal abnormalities, 7% have hyperprolactinemia.[1]

Different categories of infertility can be identified

Primary infertility: The failure to become pregnant after a year of consistent, unprotected sexual activity (or one year if the person is 35 years of age or older) is known as primary infertility.[3]

Secondary infertility: The inability to become pregnant or carry a baby to term following a previous delivery or at least one successful pregnancy is known as secondary infertility.[4]

Unexplained infertility: Fertility testing has not identified a cause for an individual's or couple's infertility.[5]

Hypothyroidism

The thyroid gland's inability to produce enough thyroid hormones to meet the body's needs results in hypothyroidism, often known as an underactive thyroid.

Subclinical and clinical hypothyroidism are the two categories of hypothyroidism based on hormone levels and symptoms.

Subclinical hypothyroidism is indicated by elevated TSH levels when T4 and T3 levels are normal; clinical hypothyroidism is indicated by elevated TSH levels when T4 and T3 levels are low.

Clinical hypothyroidism is a more severe type of the condition, whereas subclinical hypothyroidism is an earlier and milder form.[2]

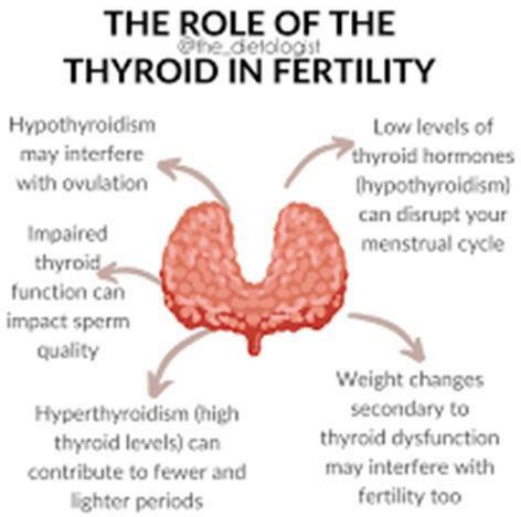
Association of hypothyroidism with infertility

The most prevalent endocrine issue among women who suffer from ovulatory dysfunction and infertility is hypothyroidism. Even milder forms of hypothyroidism, known as subclinical hypothyroidism (SCH), can interfere with reproductive function and are characterized by increased levels of TSH and normal levels of T4.

- Hypothyroidism causes an increase in TRH production, which in turn causes the pituitary gland to release prolactin and thyroid-stimulating hormone (TSH) (PRL).
- Hyperprolactinemia, caused by elevated prolactin levels, can negatively impact fertility by hindering the proper functioning of the ovaries and the gonadotrophin-releasing hormone (GnRH).
- Gonadotrophin-releasing hormone is a hormone that is produced by the pituitary gland (GnRH). Follicle-stimulating hormone (FSH) and luteinizing hormone (LH) are two other hormones that are produced in response to this hormone. Both FSH and LH are produced as a result of GnRH stimulation.
- Hormones are essential for both healthy reproduction and sexual maturity. These hormones are responsible for producing sex hormones such as estrogen, progesterone, and testosterone.
- Women's ovulation cycle and fertility can be impacted by a reduction in gonadotropin-releasing hormone (GnRH).
- Infertility and subfertility are major medical, economic, and psychological implications in

our society when they result from thyroid problems that are not detected and treated. A year of regular sexual activity without the use of contraception does not guarantee conception; one in six newlywed couples experience infertility.

- Infertility is a global health concern that impacts around 8 - 10% of women across the world. In case a couple is unable to conceive, it is known as primary infertility, while secondary infertility is when the couple has previously achieved a pregnancy but is currently facing difficulty in conceiving.
- It is observed that in some infertile couples, there is no identifiable reason for their infertility. These couples have normal parameters for all relevant factors and therefore are grouped separately as experiencing unexplained infertility.
- Testing for thyroid disease is frequently included in infertility testing for women due to the high prevalence of thyroid issues in females. While men are not typically screened for thyroid disease unless there are indications of a thyroid issue, such as symptoms of thyroid disease.[7]



Crucial role of thyroid in fertility

There are several ways in which fertility can be affected by thyroid dysfunction, such as

1. **Ovulatory dysfunction:** The inability to generate a proficient egg that can be fertilized.
2. **Defects in Luteal phase:** During the menstrual cycle, if the secretory phase is short, it can result in a luteal phase defect. This can lead to the fertilized egg failing to implant, which causes bleeding per vagina, also known as an early miscarriage. Often, this bleeding is mistaken for a regular period.
3. **High prolactin levels:** Elevated levels of TRH and reduced levels of T4 might lead to irregular or missing ovulation.

It's important to maintain normal thyroid function if you're a woman of reproductive age who's struggling with infertility, since the prevalence of hypothyroidism is much higher in these cases. This is crucial for fertility, pregnancy, and ensuring a healthy pregnancy, even in the earliest stages after conception. If you're a woman with a family history of thyroid problems, an irregular menstrual cycle, had more than two miscarriages, or are unable to conceive after one year of unprotected intercourse, it's recommended that you undergo thyroid evaluation.[7]

Prevalence of hypothyroidism in infertile women

- Hypothyroidism is more common in infertile women compared to women in their reproductive age. Subclinical hypothyroidism is more frequently observed than overt hypothyroidism.
- According to WHO estimations, 3.5% to 16.8% of Indians are thought to be affected by primary infertility overall.
- The prevalence of primary infertility in India is estimated by WHO to be between 3.5% and 16.8%.
- It has been observed that in a large series of infertile women who were not screened, the frequency of SCH ranges from 0.7% to 2.3%.[7]

MATERIALS AND METHODS

Study procedure

- An observational study was conducted at Gynecology & Obstetrics OPD of Shadan Institute of Medical Sciences and Hospital, Hyderabad, India from 2023 to 2024. The study included 100 women who were infertile and of reproductive age, between 18 and 45 years old. These women were attending the outpatient department during the study period.
- Our study required approximately 100 subjects, as per the estimation.
- Cases were selected using a systematic random sampling technique.
- Patient demographic information (age, weight, BP, etc.), presenting complaints, Gynecological history (past history, LMP, menstrual history, coital history, surgical history, etc.), and laboratory investigations (CBP, Thyroid Profile, Prolactin, Blood sugar) were gathered.
- Patients were followed up for 6 months.
- The data is then tabulated and classified according to Primary and Secondary Infertility,

Euthyroid, Hypothyroid, PCOD, and Uterine fibroids.

- Tabulated data was analyzed and the percentage prevalence was calculated.
- The formula used is as follows:

% Prevalence of Hypothyroidism =

$$\frac{\text{Number of infertile women with hypothyroidism} \times 100}{\text{Total number of infertile women}}$$

- The data is then tabulated and pie charts and graphs are drawn to demonstrate the correlation of hypothyroid with infertility.
- The other risk factors of infertility were also tabulated and depicted through pie charts and graphs.

Study Criteria

Inclusion Criteria

1. Age group: 18-45 years
2. Every woman who is infertile in the age range mentioned above (primary and secondary)
3. Infertile women with clinical and subclinical hypothyroidism.

Exclusion Criteria

1. Pregnant women
2. Women below the age of 18 and above 45
3. The study does not include patients who are unwilling to participate.
4. Chronic systemic diseases, liver disease, renal disease or cardiac disease.

RESULTS

Table 1: % Prevalence of hypothyroidism in infertile women.

No. of cases	THYROID STATUS	
	EUTHYROID	HYPOTHYROID
100	83%	17%

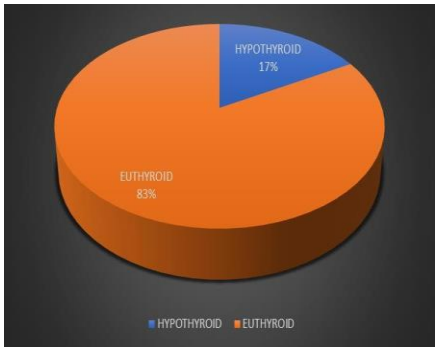


Fig 2: A pie diagram representing % prevalence of hypothyroidism in infertile women.

Table 2: Categorization of infertile women.

CATEGORY OF INFERTILITY	NUMBER OF PATIENTS
PRIMARY	73
SECONDARY	27

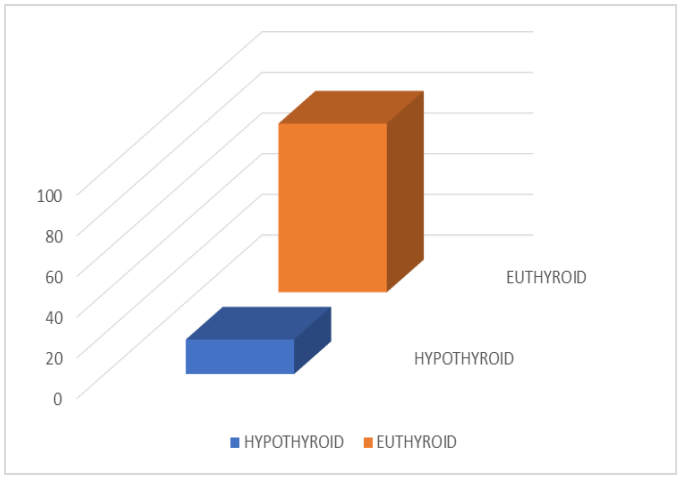


Fig 3: A 3-D chart representing % prevalence of hypothyroidism in infertile women.

As per our research, we discovered that 17 out of 100 infertile women suffer from hypothyroidism, while the remaining 83 out of 100 have normal TSH levels (euthyroid).

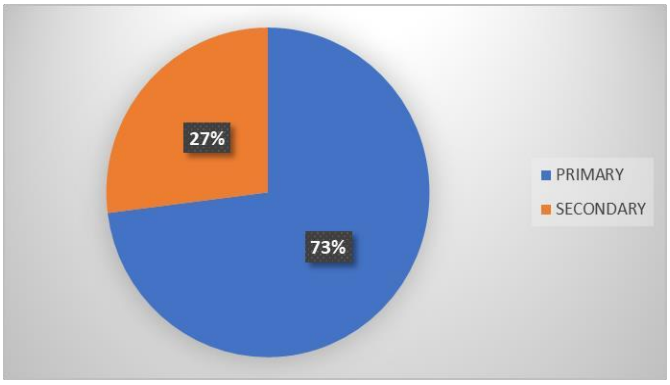


Fig 4: A pie diagram representing the categorization of infertility.

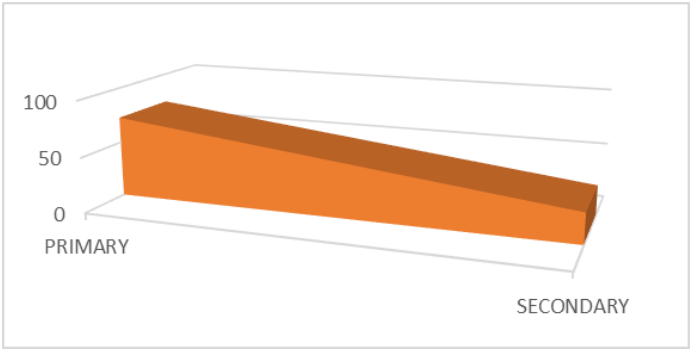


Fig 5: An area chart representing the categorization of infertility.

Table 3: A table representing the categorization of hypothyroidism in infertile women (17 hypothyroid patients).

TYPES OF HYPOTHYROIDISM	NUMBER OF PATIENTS
SUBCLINICAL	10
CLINICAL	7

In the study we conducted, we found that 73 women had primary infertility, meaning they had never been able to conceive. Additionally, we found that 27 women had secondary infertility, indicating that they had been able to conceive in the past but were currently experiencing difficulty.

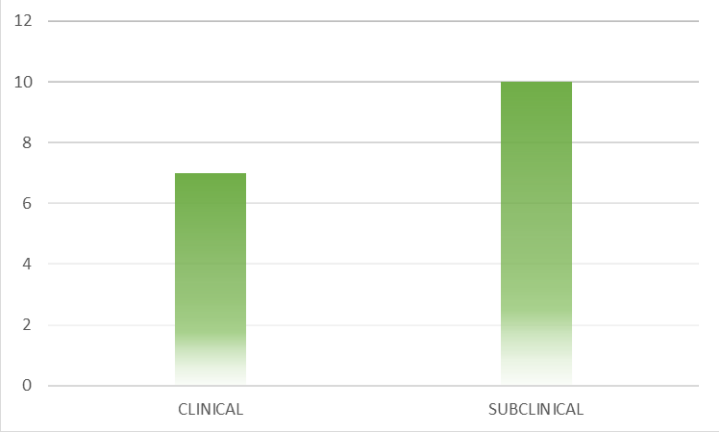


Fig 6: A bar diagram representing the categorization of hypothyroidism in infertile women.

In our study, we analyzed those 10 infertile women had subclinical hypothyroidism (mildly elevated TSH levels and normal T3 T4 levels) and 7 infertile women had clinical hypothyroidism (elevated TSH, and T3 T4 levels) among 100 infertile women.

Table 4: % Prevalence of Hypothyroidism in Primary and Secondary Infertile Women.

INFERTILE WOMEN	*No. of Patients*	*% Hypothyroidism*
Primary	73	15%
Secondary	27	2%

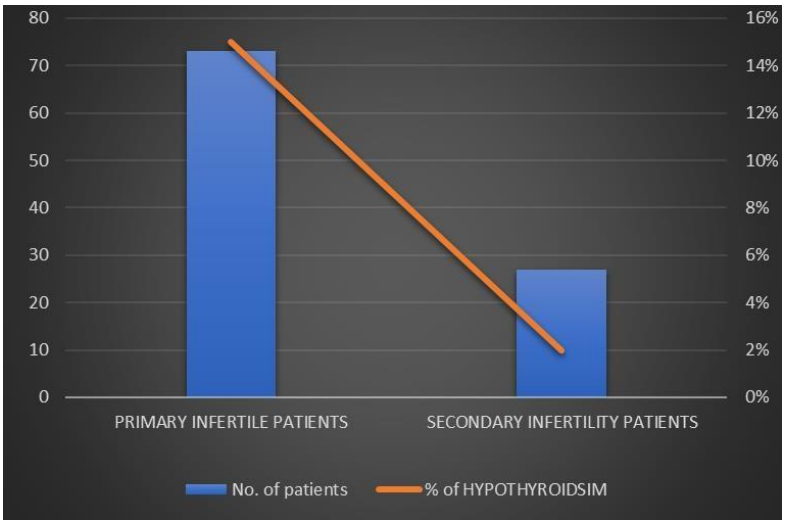


Fig 7: A bar diagram representing % Prevalence of Hypothyroidism in Primary and Secondary Infertile Women.

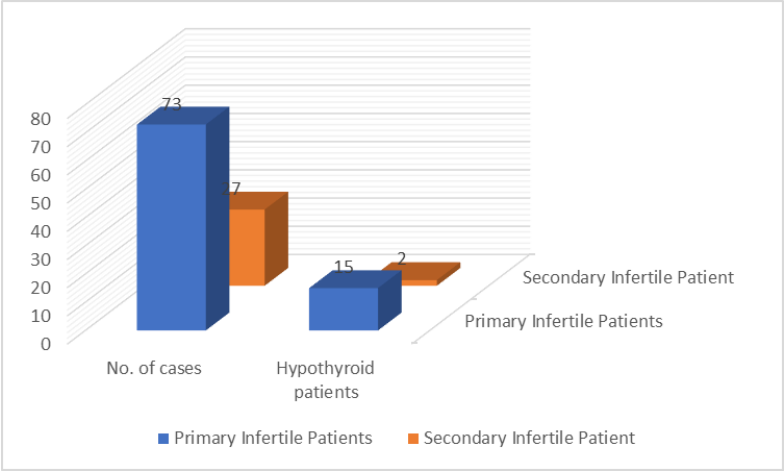


Fig 8: A bar diagram representing % Prevalence of Hypothyroidism in Primary and Secondary Infertile Women.

From our study, we found that the primary infertile category had more hypothyroid patients (i.e., 15%) compared to the secondary infertile category ((i.e., 2%).

Table 5: Prevalence of Hypothyroidism concerning the age range of infertile women.

Age Range of Patients	Number of patients	% Prevalence of Hypothyroidism
18-20	5	1
20-25	28	1
25-30	37	8
30-35	19	2
35-40	9	5
40-45	2	0

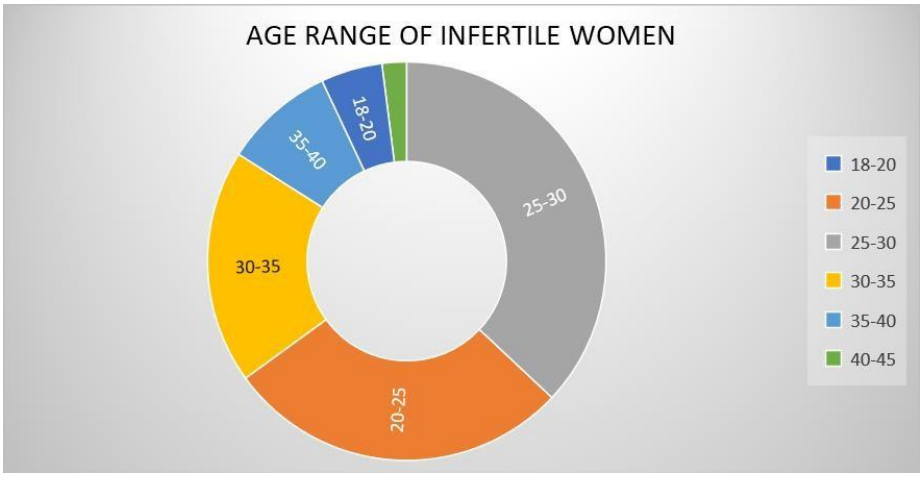


Fig 9: A pie diagram representing the age range of infertile women.

In our study, we grouped the infertile patients based on their age, and the highest number of infertile patients were found in the age group of 25-30 i.e., 37 patients.

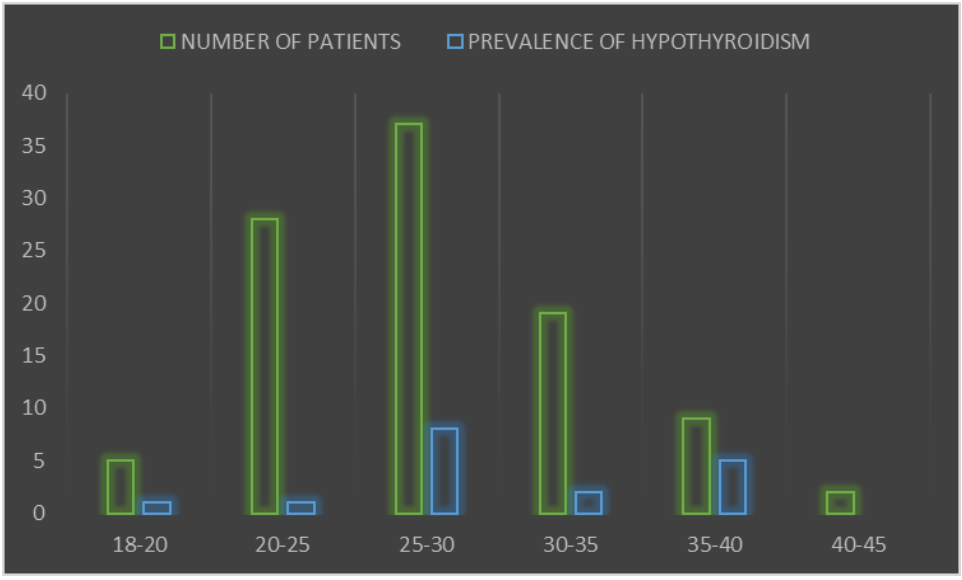


Fig. 10: A bar diagram representing the Prevalence of Hypothyroidism concerning the age range of infertile women.

Table 6: A table representing the overall mean age of infertile women along with the mean age of primary and secondary infertile women.

AGE RANGE	NUMBER OF INFERTILE WOMEN	PRIMARY INFERTILE WOMEN	SECONDARY INFERTILE WOMEN
18-20	5	5	0
20-25	28	21	7
25-30	37	28	9
30-35	19	11	8

35-40	**9**	**8**	**1**
40-45	**2**	**0**	**2**
MEAN AGE	***27.2***	***26.6***	***28.9***

After comparing the different age groups of infertile women, the highest prevalence of hypothyroid patients was found in the age group of 25-30 (8%) which also had the highest number of infertile women followed by the age group of 35-40 (5%), then 30-35 (2%), and lastly 18-20, 20-25 had 1% prevalence. No hypothyroid patients were found in the age group of 40-45.

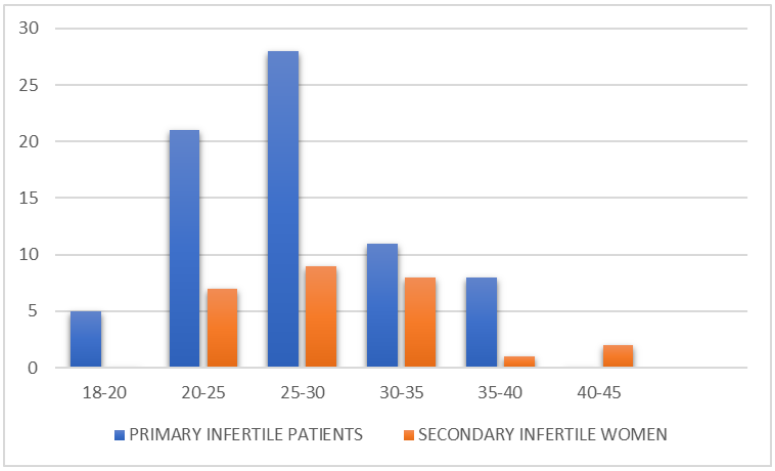


Fig 11: A bar diagram representing the mean age of primary and secondary infertile women.

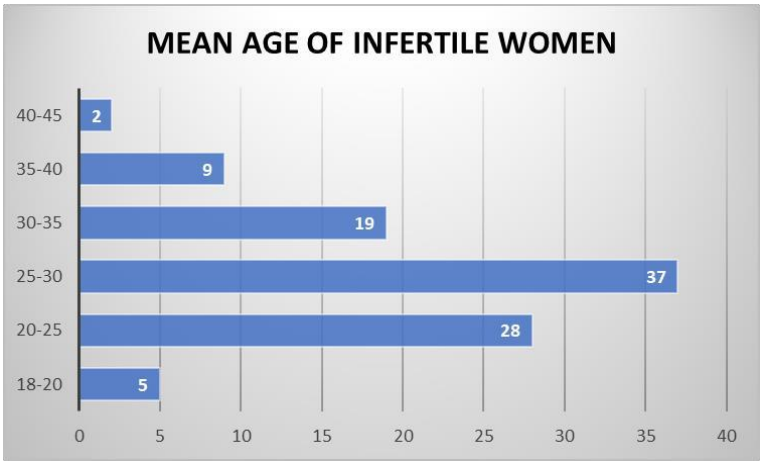


Fig 12: A bar diagram representing the overall mean age of infertile women.

The average age of women who are unable to conceive was computed and found to be 27.2. In women with primary infertility, the mean age was 26.6, while in those with secondary infertility, it was 28.9.

Table 7: A table representing % composition of infertile women identified with the following factors.

VARIOUS FACTORS LEADING TO INFERTILITY	% COMPOSITION OF INFERTILE WOMEN
HYPOTHYROID	17
PCOD	40
FIBROID	15
ENDOMETRIAL CYST	7
PSYCHOSIS	1
UNKNOWN	20

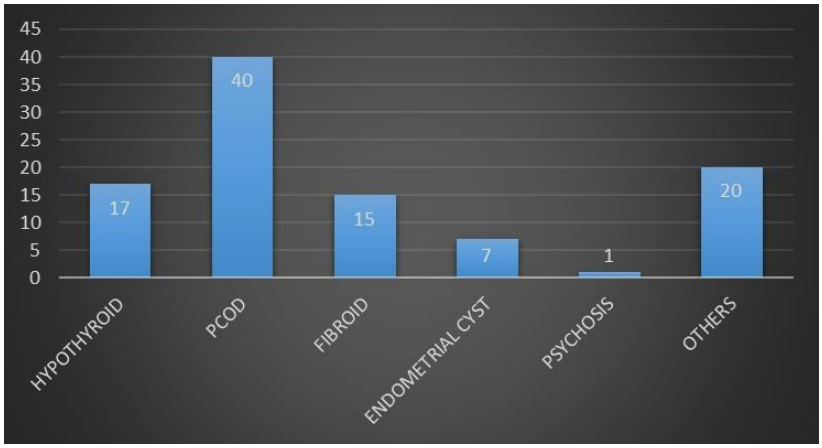


Fig 13: A bar diagram representing % composition of infertile women identified with the following factors.

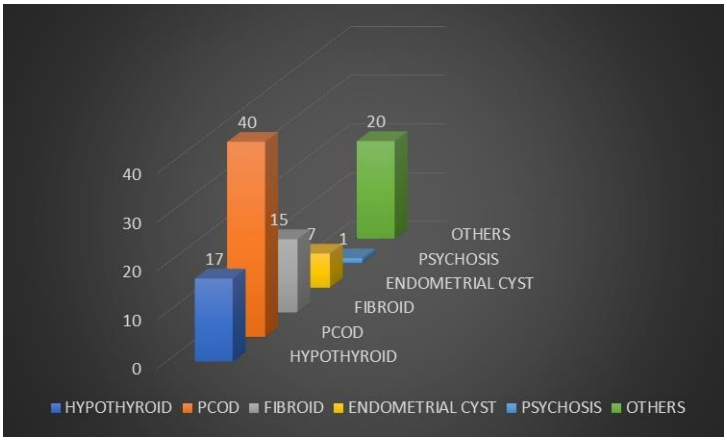


Fig 14: A bar diagram representing % composition of infertile women identified with the following factors.

After the complete analysis of our study that was conducted on 100 infertile women, 17 had hypothyroidism but a higher number was seen in the PCOD category (40) and 20 patients were infertile due to unknown reasons. Few infertile women had fibroids (15), endometrial cysts (7) and only one infertile woman had psychosis.

DISCUSSION

Our Prospective Observational study consisted of 100 women who were experiencing infertility. We collected and tabulated the results of the study, and used the data to create pie charts and graphs.

We have classified women who are unable to conceive into two groups based on their medical history - primary and secondary infertility. As per the data presented in Table 2, out of the total number of infertile women, 73 were identified as primary infertile, while the remaining 27 were categorized as secondary infertile. It is noteworthy that a majority of the participants in the study belong to the primary infertility category.

We calculated the percentage of infertile women with Hypothyroidism attending the OPD of Obstetrics and Gynecology Department of Shadan Institute of Medical Sciences, Teaching Hospital, and Research Centre and found it to be 17%. The remaining 83% of the population were euthyroid, as shown in Table 1. Our findings are consistent with the studies of Kamal A Ahmed et al. and Priyanka Gupta et al., but contradict the study of Mohana Priya et al. The prevalence of Hypothyroidism in the studies of Hasibul Hasan Shirazee et al. and Indu Verma et al. is 21.9% and 23.9%, respectively. This discrepancy could be explained by the higher sample sizes in the previously described research.

The data presented in both Table 3 and Figure 15 highlights that among 17 patients diagnosed with hypothyroidism, 10 had subclinical hypothyroidism and 7 had clinical hypothyroidism. By analyzing and Table 4, we can infer that out of 73 women who were diagnosed with primary infertility, 15 suffered from hypothyroidism. Similarly, out of the 27 women with secondary infertility, 2 were diagnosed with hypothyroidism. This suggests that a greater proportion of primary infertile women are affected by hypothyroidism compared to those with secondary infertility. These findings contradict the results of studies conducted by A A Akande et.al. and N Akter et.al.

The age group of 25-30 has the highest number of infertile women, accounting for 37% as shown in Table 5. Our study reveals that the age group of 25-30 has the highest occurrence of hypothyroidism, with a prevalence rate of 8%.

The average age for primary infertility was found to be 26.6 years, while for secondary infertility it was 28.9 years. The overall mean age was calculated to be 27.2 years, as per the

data presented in Table 6.

After conducting a thorough analysis of our study, we discovered that there were additional factors contributing to infertility. These included conditions such as PCOD, Uterine Fibroids, Endometrial cysts, Psychosis, and some cases where the root cause was unknown. Of all the factors examined, PCOD was found to have the most significant impact on infertility. (Table 7).

Infertility in women is often linked to hypothyroidism based on the results of assessments. Nonetheless, the primary cause of infertility is PCOD.

As part of the standard infertility examination, it is recommended that thyroid screening tests are conducted. Additionally, a routine Abdominal Ultrasound should be performed to diagnose PCOD in infertile women. We highly recommend this investigation as a necessary step for detecting infertility.

CONCLUSION

In a group of 100 women who had been experiencing infertility for at least a year, the incidence of Hypothyroidism was found to be 17%. It has been observed that hypothyroidism can play a significant role in infertility. Infertile women were found to have a higher prevalence of subclinical hypothyroidism in contrast to clinical hypothyroidism. The number of women suffering from primary infertility is greater than those facing secondary infertility. The prevalence of hypothyroidism is higher in the primary infertile group in contrast to the secondary infertile group. The group of women between the ages of 25 and 30 have a higher rate of infertility in contrast to other age groups. Additionally, this same age group also has a greater number of patients with hypothyroidism. Infertile women frequently suffer from hypothyroidism, which can be a contributing factor to their infertility. However, PCOD is the primary cause responsible for infertility according to the results of the assessment. A further research study must be done on the impact of PCOD on infertility. Since hypothyroidism is commonly found in women who are struggling with infertility, it is recommended to conduct a basic thyroid profile test early on in the investigation process. It is advisable for every woman to undergo a thyroid test as a part of their regular check-up. By treating hypothyroidism-induced infertility, one can avoid undergoing costly investigations and invasive procedures to overcome infertility.

Our study has a few limitations

- Less sample size
- As it was just 6 months long, study time was not sufficient to conduct follow-ups.
- Few lab parameters were not available to conduct efficient data collection and analysis.
- The study was conducted only at a single site.
- The major limitation is that we thought Hypothyroidism was a major cause of infertility but after analyzing the results we found PCOD is the major cause of infertility.

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The completion of this thesis represents a simple footstep in the stepladder of Infertility. "PREVALENCE OF HYPOTHYROIDISM IN INFERTILE WOMEN – A PROSPECTIVE OBSERVATIONAL STUDY" is definitely not achieved by the attempt and effort of one individual person and would not be possible without the collaboration of all members of the Department of Pharmacy Practice, Shadan College of Pharmacy. We are indebted to thank and dedicate this thesis to each and every one directly and indirectly involved in the successful completion of this research program.

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