# Assessment of Thyroid Disorders in Infertile Women at a tertiary care center of Nepal

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## ABSTRACT

### Background

Infertility refers to the inability to conceive after 12 months of unprotected sexual activity, is an increasing public health issue in Nepal, affecting 7.4–9.1% of reproductive-aged women. Thyroid hormones play a vital role in normal reproductive function, impacting folliculogenesis, ovulation, and implantation. Thyroid dysfunction, especially hypothyroidism, can cause irregular menstrual cycles, lack of ovulation, and difficulties in getting pregnant. This study aimed to determine the prevalence and pattern of thyroid disorders among infertile women in Nepal.

### Method

A hospital-based, Cross-sectional study was conducted at the Department of Infertility, Paropakar Maternity and Women's Hospital, Kathmandu, from June 17 to September 16, 2025. A total of 109 infertile women aged 18–45 years with at least one patent fallopian tube were included using non-probability consecutive sampling method. Serum levels of TSH, FT3, and FT4 were measured using chemiluminescence immunoassay. Data were analyzed using SPSS version 27, and associations between thyroid status and clinical variables were assessed using Chi-square ($\chi^2$) test.

### Result

Among 109 participants, 23 (21.1%) had thyroid dysfunction. Subclinical hypothyroidism was the most common (69.6%), followed by overt hypothyroidism (26%) and subclinical hyperthyroidism (4.3%). No cases of overt hyperthyroidism were observed. A significant association was found between thyroid status and age group ($p = 0.04$), but not with BMI, type of infertility, ethnicity, education, occupation, or tubal status.

### Conclusion

Thyroid disorders were prevalent in about one-fifth of infertile women, with subclinical hypothyroidism as the predominant abnormality. As thyroid dysfunction is easily diagnosable and treatable, routine thyroid function testing should be an integral part of infertility evaluation to enhance reproductive outcomes in Nepal.

**Keywords:** Infertility, Thyroid dysfunction, Subclinical hypothyroidism

## Introduction

Infertility refers to the failure to conceive after at least 12 months of regular, unprotected sexual intercourse (or 6 months in women over 35 years).[1] Infertility is a major public health issue that impacts the local economy.[2] Infertility can be either primary, where there has never been a previous pregnancy, or secondary infertility, where there has been a previous pregnancy.[3]

Recent global estimates suggest that nearly one-sixth or roughly 17.5% of the population experience infertility at some point in their reproductive life. In Nepal, studies report prevalence rates of infertility from 7.4%[4] to 9.1%[5] among reproductive-

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aged women. Thyroid hormones play a crucial role in female fertility from folliculogenesis, hormonal balance, ovulation to placentation .[6] Thyroid dysfunction, such as hypothyroidism or hyperthyroidism, can lead to infertility by causing irregular menstrual cycles, anovulation, or luteal phase defects. [7]

Many thyroid disorders are easily diagnosable and treatable, making thyroid function assessment an essential part of infertility work-up. This study aims to determine the prevalence and types of thyroid disorders among infertile women in Nepal, highlighting the importance of early diagnosis and intervention in improving reproductive outcomes.

## Methods

A prospective, hospital-based cross-sectional study was carried out among infertile women who had failed to conceive after one year of unprotected intercourse. The study was carried out at the Department of Infertility, Paropakar Maternity and Women's Hospital (PMWH), Thapathali, Kathmandu, from June 17 to September 16, 2025.

The sample size was calculated using Cochran's formula:[8]

$$n = \frac{Z^2 pq}{d^2}$$

Where: z=1.96 (95% confidence interval)

p = 0.077 (prevalence of thyroid disorder among infertile women)[9]

d = 5 % (Maximum tolerable error or level of precision).

$$\text{Sample size } n = \frac{1.96 \times 1.96 \times 0.077 (1 - 0.077)}{0.05 \times 0.05}$$

$$= 109$$

Thus, the required sample size was 109.

Infertile women aged 18–45 years with at least one patent fallopian tube were included in the study. Women who had received medications affecting thyroid function, had bilateral fallopian tube blockage, congenital anomalies of the urogenital tract, or any obvious organic lesion were excluded. Patients with a history of thyroid disease or previous thyroid surgery, as well as couples with male factor infertility, were also excluded.

In this study, infertility was defined as the failure to achieve pregnancy after 12 months or more of regular unprotected sexual intercourse. Subclinical hypothyroidism (SCH) was defined as a TSH level > 4 mIU/L with normal FT4 and/or FT3 levels, while clinical hypothyroidism was defined as a TSH level > 4 mIU/L with FT4 and/or FT3 below the reference range. Clinical hyperthyroidism was defined as a TSH level < 0.34 mIU/L with elevated FT4 and/or FT3, and subclinical hyperthyroidism was defined as a TSH level < 0.34 mIU/L with normal FT4 and/or FT3 levels.

## Data Collection

After obtaining approval from the Institutional Review Board (IRB) of NAMS, all relevant staff were informed about the study. Eligible participants attending the infertility OPD six days a week (9 am to 3 pm, except Saturday) were approached, and written informed consent was obtained after explaining the study objectives. Detailed histories were collected using a structured questionnaire, including demographic data, medical and surgical history, lifestyle factors, and reproductive history.

Confidentiality was maintained by assigning codes to participant identifiers and storing data in locked cabinets. No additional burden was imposed on participants, as thyroid function tests (TFTs) are routine in infertility work-up.

A detailed clinical examination was performed, including measurement of height (using a stadiometer) and weight (using a digital scale) to calculate BMI (kg/m²). Patients were categorized according to WHO BMI classifications.

Serum thyroid levels (FT3, FT4, TSH), hemoglobin, and random blood sugar were measured. Hysterosalpingography (HSG) and abdominal and pelvic ultrasound were performed to rule out tubal or anatomical factors. Fasting venous samples (5 mL) were collected, serum separated, and analyzed using chemiluminescence immunoassay (CLIA). Reference ranges used were: TSH 0.34–4 mIU/L, FT4 0.7–1.8 ng/dL, and FT3 2.2–4.2 pg/mL. As recommended by The American Thyroid Association (ATA), TSH range of 0.4–4.0 mIU/L was applied for the diagnosis of subclinical and overt thyroid disease.[10]

## Statistical Analysis

Data were analyzed using SPSS version 27. Descriptive statistics were used to summarize demographic and clinical variables. The prevalence of thyroid disorders (subclinical and overt) was calculated, and associations with age, infertility

type, BMI, and other variables were assessed using Chi-square ($\chi^2$) test. A p-value < 0.05 was considered statistically significant and was taken as the critical value for all comparisons, with a 95% confidence interval.

## Result

A total of 109 infertile women were included in the study. Among them, 86 women (78.9%) were euthyroid, while 23 women (21.1%) had thyroid disorders (Table 1).

**Table 1: Thyroid Status among Study Participants**

| Thyroid status | Frequency (n) | Percentage (%) |
|---|---|---|
| Euthyroid | 86 | 78.90 |
| Thyroid disorder | 23 | 21.10 |
| Total | 109 | 100.00 |

Subclassification of thyroid disorders revealed that 16 women (69.6%) had subclinical hypothyroidism, 6 women (26%) had overt hypothyroidism, and 1 woman (4.3%) had subclinical hyperthyroidism. No cases of overt hyperthyroidism were observed (Table 2).

**Table 2: Subclassification of Thyroid Disorders**

| Thyroid disorder | Frequency (n) | Percentage (%) |
|---|---|---|
| Overt hypothyroidism | 6 | 26.00 |
| Overt hyperthyroidism | 0 | 0.00 |
| Subclinical hypothyroidism | 16 | 69.56 |
| Subclinical hyperthyroidism | 1 | 4.35 |
| Total | 23 | 100.0 |

The majority of participants (48.6%) were aged 25–31 years, followed by 32–38 years (33.9%), 18–24 years (14.7%), and 39–45 years (2.8%). The mean age of the participants was 29.73 ± 5.1 years.

Regarding BMI distribution, more than half of the women were overweight (53.2%), 45% had normal BMI, and 1.8% were underweight. The mean BMI was 24.73 ± 3.84 kg/m².

In terms of type of infertility, 74 women (67.9%) had primary infertility, while 35 women (32.1%) had secondary infertility.

Concerning ethnicity, Adibasi/Janajati women represented the largest proportion (40.4%), followed by Brahmin/Chhetri (36.7%), Terai/Madhesi (14.7%), Dalit (5.5%), and Others (2.8%).

Regarding educational status, most women had higher secondary education (31.2%), followed by higher education (25.7%), secondary education (25.7%), primary education (14.7%), informal education (1.8%), and illiterate (0.9%).

In terms of occupation, the majority were housewives (51.4%), followed by service holders (24.8%), businesswomen (18.3%), and farmers (2.8%).

Regarding tubal status, 91 women (83.5%) had bilateral tubal patency, whereas 18 women (16.5%) had unilateral patency.

**Table 3: Distribution of Socio-demographic Characteristics (n = 109)**

| | Categories | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age group (years) | 18–24 | 16 | 14.68 |
| | 25–31 | 53 | 48.62 |
| | 32–38 | 37 | 33.94 |
| | 39–45 | 3 | 2.75 |
| BMI (kg/m²) | Underweight (<18.5) | 2 | 1.83 |
| | Normal (18.5–24.9) | 49 | 45.95 |
| | Overweight (25.0–29.9) | 58 | 53.21 |
| | Obese (>30) | 0 | 0.00 |
| Ethnic group | Brahmin/Chhetri | 40 | 36.70 |
| | Adibasi/Janajati | 44 | 40.37 |
| | Terai/Madhesi | 16 | 14.68 |
| | Dalit | 6 | 5.50 |
| | Others | 3 | 2.758 |
| Education status | Higher education | 28 | 25.69 |
| | Higher secondary | 34 | 31.19 |
| | Secondary | 28 | 25.69 |
| | Primary | 16 | 14.68 |
| | Informal | 2 | 1.83 |
| | Illiterate | 1 | 0.92 |
| Occupation | Service | 27 | 24.77 |
| | Farmer | 3 | 2.75 |
| | Business | 20 | 18.35 |
| | Housewife | 56 | 51.38 |
| | Other | 3 | 2.75 |

**Table 4: Type of Infertility and Tubal Status**

| Variables | Categories | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Type of infertility | Primary | 74 | 67.89 |
| | Secondary | 35 | 32.11 |
| Tubal status | Bilateral patent | 91 | 83.49 |
| | Unilateral patent | 18 | 16.51 |

### Association of Thyroid Status with Clinical Variables

Figure 1 shows the distribution of thyroid status across age groups. Statistically significant association was seen between age group and thyroid status (p = 0.04). However, no significant associations were found between thyroid status and BMI, type of infertility, ethnic group, education level, occupation, or tubal status.

## Discussion

In this cross-sectional study of 109 infertile women attending Paropakar Maternity and Women's Hospital, we observed a prevalence of thyroid disorders of 21.1%. The prevalence found in this study is comparable to reports from other national and international studies. For instance, Maskey and Rijal reported thyroid dysfunction in 18.4% of infertile women, while Rijal et al. documented a slightly higher prevalence of 25.6%.[11,12] Manandhar et al. observed a lower rate of 7.7%, whereas Joshi et al. reported an even higher prevalence of 30%.[9,13]These discrepancies may reflect differences in study design, sample size, inclusion criteria, and diagnostic thresholds. Many studies, for example, did not clarify whether participants with bilateral tubal block or male factor infertility were excluded, which could artificially inflate or reduce prevalence estimates. Our study addressed this by excluding bilateral tubal blockage, male factor infertility, known congenital urogenital abnormality and known thyroid disease, thus providing a more specific assessment of thyroid dysfunction among women with otherwise unexplained infertility.

Internationally, the reported prevalence of thyroid disorders in infertile women also varies widely. Indian studies frequently report higher prevalence, ranging from 29% to more than 50% which may

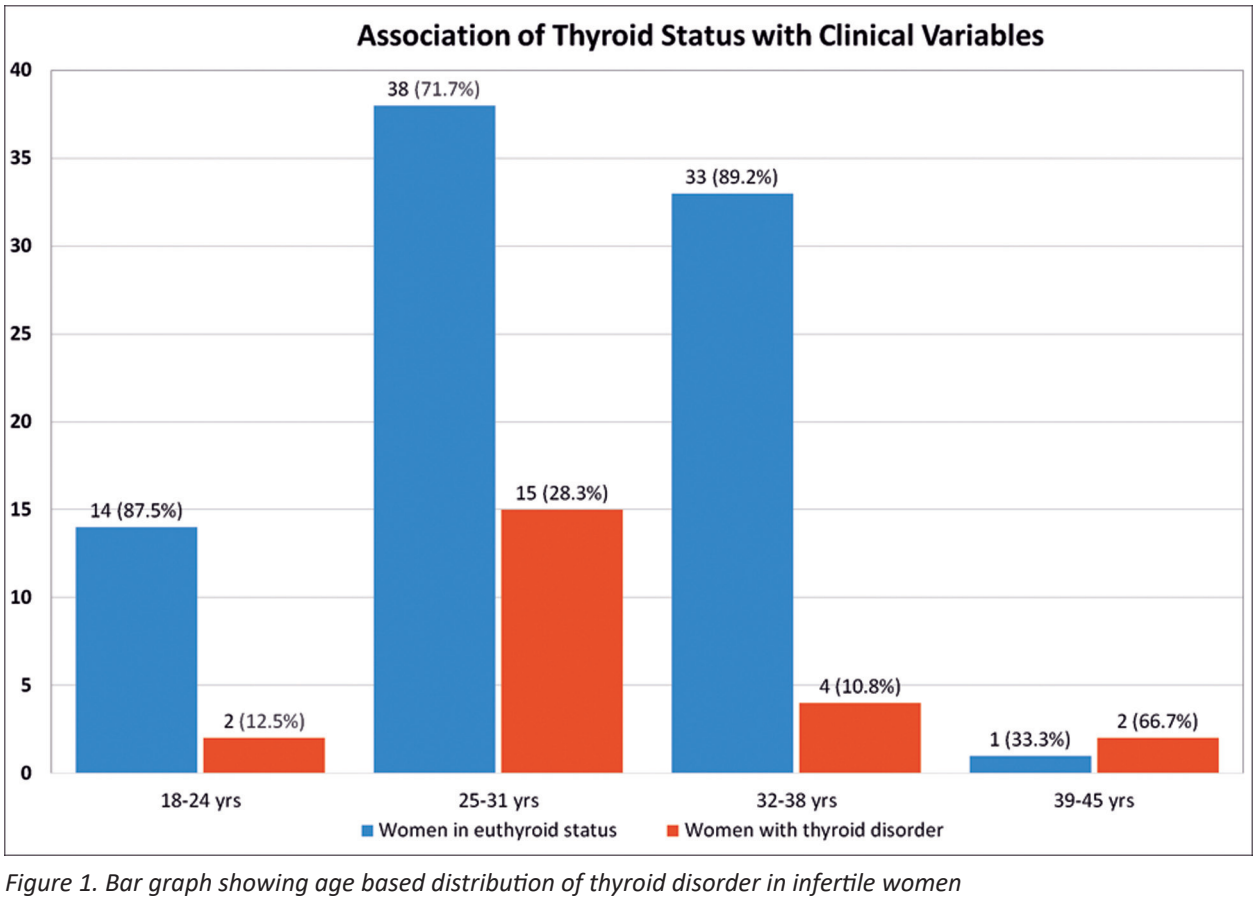


*Figure 1. Bar graph showing age based distribution of thyroid disorder in infertile women*

relate to the high burden of iodine deficiency and autoimmune thyroid disease in that setting.[14,15] Conversely, African studies, such as those from Nigeria, have reported much lower rates, approximately 4.6%, possibly reflecting differences in iodine nutrition, genetic susceptibility or healthcare-seeking behavior.[16] These international variations highlight the importance of local epidemiological studies to inform country-specific guidelines. Nepal, where iodine deficiency was historically common but has improved due to national salt iodization programs, may represent a transitional population in which thyroid disorders remain a substantial yet evolving health burden.[17]

Among the thyroid abnormalities identified in our study, subclinical hypothyroidism was by far the most common, affecting nearly 70% of those with thyroid dysfunction. This was followed by overt hypothyroidism (26%) and subclinical hyperthyroidism (4.3%). Importantly, no cases of overt hyperthyroidism were observed. These findings are in line with several previous studies, which consistently show subclinical hypothyroidism to be the predominant thyroid abnormality in infertile women.[9,11,18] For example, Maskey and Rijal also identified subclinical hypothyroidism as the leading form of thyroid dysfunction, while Sridevi et al. reported a somewhat different pattern, with subclinical hyperthyroidism being nearly as common as subclinical hypothyroidism.[11,15] This variability suggests that the distribution of thyroid disorders may vary across populations due to dietary, genetic, and environmental influences.

The predominance of subclinical hypothyroidism has important clinical implications. Even in the absence of overt symptoms, subclinical hypothyroidism can interfere the hypothalamic pituitary ovarian axis, leading to ovulatory dysfunction, menstrual irregularities and luteal phase defect, ultimately impairing fertility.[19] Furthermore, untreated hypothyroidism, even in its subclinical form, has been associated with adverse pregnancy outcomes such as miscarriage, preterm labor, and impaired neurodevelopment in offspring.[20]Because treatment with levothyroxine is inexpensive, safe, and widely available, the detection and management of subclinical hypothyroidism may substantially improve both fertility and pregnancy outcomes. Our findings therefore support the routine inclusion of thyroid function testing as part of infertility evaluation in Nepal.

With respect to infertility type, primary infertility was more common than secondary infertility in our cohort, affecting 67.9% versus 32.1% of participants. This is consistent with the broader literature, which often reports higher rates of primary infertility in hospital-based samples.[9,18] Thyroid dysfunction was present in 20.3% of women with primary infertility and 22.9% of those with secondary infertility, a difference that was not statistically significant. This suggests that thyroid dysfunction contributes to both types of infertility at similar rates. Manandhar et al. also observed higher thyroid dysfunction in primary infertility, though their findings were not statistically conclusive.[9] The lack of significant association in our study may be related to sample size limitations, but it also underscores that thyroid dysfunction is a risk factor across the infertility spectrum, rather than being limited to one subgroup.

The mean age of participants was 29.7 years, a figure that is consistent with other Nepali and international studies on infertility.[12,13] In our study thyroid disorders were most common in women aged 39–45 years (66.7%) and least common among those aged 32–38 years (10.8%). A statistically significant association between thyroid dysfunction and age group ($p = 0.04$) was observed. This aligns with the known epidemiology of thyroid disease, which becomes more prevalent with advancing age, particularly among women.[21] Age is also independently associated with declining fertility, suggesting that thyroid dysfunction in older infertile women may represent a double burden.

In terms of BMI, more than half of our participants were overweight, reflecting the growing burden of overweight and obesity in urban Nepal.[22] Although the association between thyroid dysfunction and BMI did not reach statistical significance in our cohort, a trend was observed. Women with normal BMI had the lowest prevalence of thyroid dysfunction (16.3%), whereas overweight women had a prevalence of 24.1%, and underweight women had the highest prevalence at 50%. However, the underweight group included only two women, limiting the reliability of this estimate. The observed pattern is suggestive of a U-shaped relationship, where both low and high BMI may increase the risk of thyroid abnormalities. This trend is consistent with international evidence, as studies from India and Nigeria have demonstrated higher rates of thyroid dysfunction among overweight and

obese infertile women while underweight women are also at risk due to nutritional deficiencies and hypothalamic-pituitary axis disruption.[14,17] Sociodemographic factors, including ethnicity, education, and occupation, showed no statistically significant association with thyroid dysfunction in our study. However, this does not preclude an indirect influence of such factors. Ethnic differences in diet, particularly iodine consumption, may affect thyroid status, while education and occupation may influence health-seeking behavior, awareness, and access to medical care. Previous studies from Nepal have suggested that sociodemographic determinants may shape thyroid health indirectly[1,2]. Larger population-based studies may be better positioned to detect such associations.

With regard to tubal status, the majority of participants (83.5%) had bilateral tubal patency, while 16.5% had unilateral patency. These findings are consistent with previous Nepali studies, including those by Rijal et al. and Maskey & Rijal which also reported high rates of tubal patency among infertile women.[10,11] This suggests that structural causes of infertility may be less common than functional or hormonal causes, such as thyroid dysfunction, in this population. The predominance of tubal patency reinforces the clinical importance of screening for endocrine abnormalities, including thyroid disorders, in women presenting with infertility.

From a mechanistic perspective, thyroid dysfunction affects fertility through multiple pathways. Hypothyroidism can disrupt gonadotropin-releasing hormone pulsatility, leading to menstrual irregularities, anovulation, and luteal phase defects.[18] It can also elevate prolactin levels, which further impair ovulatory function.[23] Hyperthyroidism, though less common in our study, may cause menstrual irregularities, reduced fecundity, and adverse pregnancy outcomes[15]. Both hypothyroidism and hyperthyroidism can affect sex hormone-binding globulin, estradiol metabolism, and endometrial receptivity, thereby reducing the likelihood of conception and implantation.[24]

Our study has several strengths. We excluded women with bilateral tubal blockage and those with a prior history of thyroid disease, thereby focusing on a population more representative of unexplained infertility. We also applied internationally recognized diagnostic criteria and used reliable laboratory methods for thyroid function testing. However, some limitations must be acknowledged. The study was conducted at a single tertiary hospital in Kathmandu, which may limit generalizability to rural populations. The sample size, while adequate, was not large enough to detect subtle associations between thyroid dysfunction and some demographic variables. Additionally, we did not assess thyroid autoantibodies, which may have provided further insights into the autoimmune etiology of thyroid dysfunction in infertile women.[25]

Despite these limitations, our findings have important clinical implications. Given that more than one in five infertile women had thyroid dysfunction, and that most of these cases were subclinical and potentially treatable, routine thyroid function testing should be considered an essential component of infertility evaluation in Nepal. Early detection and appropriate management of thyroid abnormalities can restore ovulatory cycles, improve menstrual regularity, enhance conception rates, and increase the success of assisted reproductive technologies such as in vitro fertilization.[26] Furthermore, timely treatment of thyroid dysfunction can reduce the risk of miscarriage and adverse pregnancy outcomes, thereby improving both maternal and neonatal health.[27]

In conclusion, this study contributes to the growing body of evidence that thyroid dysfunction is a common and clinically important factor in female infertility in Nepal. Subclinical hypothyroidism is the predominant abnormality, particularly among women with advancing age and abnormal BMI. Although not significantly associated with type of infertility or sociodemographic factors, thyroid dysfunction remains an important and modifiable contributor to infertility. Our findings reinforce the need for routine thyroid screening in infertility clinics and underscore the importance of integrating endocrine evaluation into reproductive healthcare services in Nepal.

## Conclusion

In this study of 109 infertile women in Nepal, thyroid dysfunction was observed in 21.1%, with subclinical hypothyroidism being the most common abnormality (69.6%), followed by overt hypothyroidism (26%) and subclinical hyperthyroidism (4.3%). Thyroid disorders were significantly more prevalent in older women, while no significant associations were observed with BMI, type of infertility, ethnicity,

education, occupation, or tubal status. This study highlights a considerable burden of thyroid dysfunction as a common and treatable contributor to infertility among women attending a tertiary care centre in Nepal. Routine thyroid screening should be incorporated into infertility evaluations to improve reproductive outcomes.

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