

# Prevalence of Thyroid Problems Among Patients Attending at Siddharthanagar City Hospital

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## Abstract

*Thyroid gland is vital gland. It produces Thyroxine T3 and Tri-Iodothyronine T4 hormones which are needed for the growth and development. Iodine is needed for the formation of T3 and T4 hormones. Iodine is found in different food such as sea food, vegetables produced in Iodine rich soil and table salt. The associated problems of thyroid gland are hypothyroidism and hyperthyroidism. The objective of this study was to find out the prevalence of thyroid problems attending at Siddharthanagar City Hospital.*

*It was hospital based retrospective study. Data related to thyroid problems T3,T4 and TSH was collected from hospital laboratory reports . The tests were done using Semi Auto Clia Plate Analyzer of TOSOH India Company.*

*The total number of lab reports was 299 taken for study. Among them the percentage of male and female was 21.7 and 78.3 respectively. The overall prevalence of thyroid problems was 5.9 % among general public. The overall prevalence of hypothyroidism was 9.69% and hyperthyroidism was 2.17% respectively. The prevalence of thyroid problems was seen more in female.*

*This study showed that thyroid problem including hyperthyroidism and hypothyroidism is common. Female population and 21-40 years age group are highly suffered in comparison to male population.*

**Keywords:** *Thyroxine, Tri-Iodothyronine, Hypothyroidism, Hyperthyroidism, Prevalence*

## Introduction

The load of non-communicable disease is so higher, about 40 million deaths each year, equivalent to 70% of all deaths globally. Thyroid disorders are one among all and global burden was estimated to be more than 2 billion and in India it was expected to be more than 40 million .Internationally, emphasis is given to non-communicable diseases due to increased mortality and morbidity in current situation (Sharma. N.P.Rubesh, 2017).

Thyroid gland is the main endocrine gland. It is located in the neck in front of the larynx and trachea at the level of fifth, sixth, seventh cervical and first thoracic vertebrae. It is mostly vascular gland and weighs about 30 grams. It is surrounded by a fibrous capsule, butterfly shaped and consisting to two lobes (Bhandari et al., 2017).

Iodine is necessary for the formation of the thyroid hormones Thyroxin and Tri-iodothyronine. T3 and T4 hormones are needed for normal growth and development .The sources of Iodine are seafood, vegetables produced in iodine rich soil and Iodized table salt. Thyroid gland takes up

Iodine from the blood by the process of iodine trapping. The flow of T3 and T4 into the blood is stimulated by Thyroid Stimulating Hormone (TSH) from adenohypophysis. The release of TSH is stimulated by thyrotrophin releasing hormone (TRH) from the hypothalamus and the secretion of TRH is stimulated by exercise, stress, malnutrition, low level of plasma glucose and sleep. TSH secretion depends upon the plasma levels of T3 and T4 hormones because these hormones control the sensitivity of the anterior pituitary to TRH. As of negative feedback mechanism, increased levels of T3 and T4 decrease secretion of TSH secretion and vice versa. Dietary iodine deficiency rises TSH secretion causing proliferation of thyroid gland cells and extension of the gland known as goiter (Waugh Anne, 2014).

A review report published by the American College of Physicians estimated that the prevalence of overt hypothyroidism in women over 70 years of 2% and in men above 60 years of 0.8%. For elderly population related hyperthyroidism, the numbers were 0.6% for women over 60 years and 0.1% for men above 60 years (Benseñor et al., 2011).

The main function of vitamin D is regulating bone, metabolism, calcium and phosphorus homeostasis. Over the past time the importance of vitamin D in non-skeletal actions has been studied, including the role of vitamin D in autoimmune diseases, metabolic syndromes, cardiovascular disease, cancers, and all-cause mortality (Kim, 2017).

Some environmental factors are also concerned with autoimmune thyroid disorders such as high intake of iodine, selenium and vitamin D deficiency, exposure to radiation or medical radiation. Viral infections are also vital environmental factors in pathogenesis of auto immune thyroid disease (Ferrari et al., 2017).

A current study carried out in overweight/obese children and adults provide evidence that body mass index (BMI) may significantly influence in different indicators, thus theoretically affecting the epidemiological evaluation of nutritional iodine status in populations (Moleti et al., 2021).

It is expected that as many as one and a half billion people in the world are at risk for thyroid problems. Subclinical hypothyroidism is also a vital situation, affecting up to 20% of persons beyond 60 years of age. Clinical endocrinologists accepted that most patients with subclinical hypothyroidism require therapy (Profile, 2014).

The main problems of thyroid gland are hyperthyroidism and hypothyroidism. The responsible factors are globalization, modernization and changes in food habit there is increased burden of thyroid problems including thyroid cancer. The prevalence of different types of thyroid disease reported in Arab world ranging from 6.18 to 47. Almost 34% prevalence of goiter was reported in Arabian countries such as Egypt, Algeria and Bahrain with 25.25, 86 and 1.7% respectively. Gender, dietary factors, iodine deficiency, genetics, diabetes and x-ray radiation were reported as influencing factors associated with different type of thyroid diseases (Saad et al., 2016).

The functions of thyroid hormones are normal growth, sexual development and maturity of reproductive organs. Hypothyroidism and hyperthyroidism are interconnected different changes in reproductive functions like reproductive depletion, delay in puberty, and irregularity in menstrual cycle and infertility. A descriptive cross-sectional study was conducted at outdoor of Gynecology and Obstetrics department, DG Khan Medical College and Nishtar Hospital, Multan Pakistan in 2015. Among 250 patients tested with T3, T4 and TSH, 38.4% were suffered. The percentage of hypothyroidism and hyperthyroidism were 29.2% and 7.6% respectively. (Waseem Aslam, 2021) A qualitative interview among twenty seven participants conducted in UK twelve patients found TSH level outside the reference range (King et al., 2017).

In India about 42 million are suffering people from thyroid problems. There is higher prevalence in women. The reason may be associated with estrogen and progesterone defects. Hypothyroidism and hyperthyroidism are connected with increased risk from heart disease and adverse effects of thyrotoxicosis in terms of osteoporosis. Hypothyroidism contributes to morbidity from osteoporosis, hyperlipidemia, hypercholes, terlemia, cardiovascular and neuropsychiatry diseases in population. A retrospective hospital based study was carried out involving 250 males and 1826 females with suspected of thyroid disorder. Among all, highest prevalence was found in 30-49 years age group. The highest value of TSH concentration was seen in the age group of 60- 69 years and lowest TSH was seen in age group 10 – 19 years (Deokar PG, 2016).

Nepal is also facing different types of thyroid problems. It is also a major public health problem in Nepal. It is estimated that 0.2% of the deaths in our country are due to endocrine disorders along with thyroid causes. In previous years, iodine deficiency was major cause of hypothyroidism but now it is not the cause as autoimmunity as the major cause (Upadhyaya TL, 2018).

In current situation, extension of laboratory facilities is rapidly running. The thyroid disorders may cause complications like hypertensive heart disease, coronary arterial disease, arthralgia, severe myalgia, infertility and others. A descriptive cross-sectional study about awareness of thyroid problems was conducted among 105 female patients attending at Neuro and Allied Clinic Bhairahawa, Nepal in 2019. Majority of them (80%) were aware of about it is more common in female population. One third of them had family history of thyroid problems (Ghimire et al., 2019).

A study conducted in Dhulikhel Hospital-Kathmandu University Hospital in Dhulikhel, found overall prevalence of the thyroid dysfunction was 31.25% (40). Of the 128 subjects, 28.90% (37) had subclinical hypothyroidism, 1.55% (2) had overt hyperthyroidism, 0.80% (1) had subclinical hyperthyroidism and 68.75% (88) were euthyroid. Overt hypothyroidism was not present in any of the subject (P. Gyawali, 2012).

The evidence on the effect of iodine fortification of foods, beverages, condiments, or seasonings other than salt on reducing goiter, improving physical development measures, and any adverse effects is uncertain (Ma et al., 2019).

## Methodology

**Study design:** Descriptive Cross-Sectional study and retrospective study.

**Study population:** Patients attending in biochemistry department of Siddharthanagar City Hospital Bhairahawa

**Data collection techniques:** Review of biochemistry lab reports of first quarter of FY 2078/79 in Siddharthanagar City Hospital. Altogether 299 lab reports were analyzed. Among 299 cases 65(21.7%) were male and 234(78.3%) were female. The approval was taken by Siddharthanagar City Hospital administration. According to hospital information and observation of T3,T4 and TSH tests were done using Semi Auto Clia Plate Analyzer of TOSOH India company which is found reliable and valid.

**Inclusion criteria:** T3,T4 and TSH report of first quarter FY2078/79 were included. Those who met the criteria were included.

**Exclusion criteria**-Those who do not meet the criteria were not included in the study. Age below 14 years was not included in the study. Duplication persons were not included in the study.

Thyroid function was considered normal (Euthyroidism) when subject had all three hormones within reference value level. Hyperthyroidism refers to increased level of T3, T4 & lower than normal TSH. Hypothyroidism refers to a decrease in T3, T4 & increase in TSH. The classification is based on gender, age wise distribution of cases, classification of cases based on serum TSH level, age-sex wise distribution of cases etc were parameters to be analyzed in our study.

**Sample and sample size determination**-Non-probability convenience sampling method was used. Sample size was calculated with the formula  $z^2 \times pq/e^2$  Where

$$z^2 = (1.96)^2, P = 22.42\%, q = 100-p \text{ ie } 100-22.42 = 77.78, e^2 = 5^2 = 25$$

Needed sample size is 268 but I collected data of first quarter of FY 2078/79 and it was 299 cases.

Statistical Analysis-. The data was entered into Microsoft excel 2010 & analyzed by statistical package for social science (SPSS version 20).

## Results

*Table 1. Number of patients tested thyroid functions in four months*

| Months       | Frequency  | Percentage |
|--------------|------------|------------|
| Shrawan      | 87         | 29.10      |
| Bhadra       | 61         | 20.40      |
| Asoj         | 84         | 28.09      |
| Kartik       | 67         | 22.41      |
| <b>Total</b> | <b>299</b> | <b>100</b> |

Among tested in first quarter of FY 2078/79, maximum were tested in Shrawan 87(29.1%) and minimum in Bhadra 61(20.4%). Similarly the number of persons tested in Asoj and Kartik were 84(28.1%) and 67(22.4%) respectively. The differences may be due to the flow of patients as of Dasain and Tihar festival and duration of days in different months.

*Table 2 .Number of patients according to age and sex*

| Age Groups(Years) | Gender of Patient as of gender |            | Total      |
|-------------------|--------------------------------|------------|------------|
|                   | Male                           | Female     |            |
| <21               | 4                              | 16         | 20         |
| 21-40             | 20                             | 152        | 172        |
| 41-60             | 29                             | 51         | 80         |
| >60               | 12                             | 15         | 27         |
| <b>Total</b>      | <b>65</b>                      | <b>234</b> | <b>299</b> |

Majority of the patients were 21-40 years and minority were below 21 years of age and majority of the patients were female (234) and minority were male patients (65). This shows that women are aware of their health problems.

Table 3. TSH level of patients tested according to gender

| Gender       | TSH Level of Patient |            |           | Total      |
|--------------|----------------------|------------|-----------|------------|
|              | Low                  | Normal     | High      |            |
| Male         | 1                    | 57         | 7         | 65         |
| Female       | 4                    | 208        | 22        | 234        |
| <b>Total</b> | <b>5</b>             | <b>265</b> | <b>29</b> | <b>299</b> |

Most of (265) of them found normal results and level of TSH was high among 29 patients and low result among 5 patients. Majority of the female found high and low value of TSH in comparison to male. The result suggests that there is high prevalence of Hypothyroidism among female groups.

Table 4. T3 and T4 level of patients according to gender

| Gender       | T3 level of patient |            |          | T4 level of patient |            |          |
|--------------|---------------------|------------|----------|---------------------|------------|----------|
|              | Low                 | Normal     | High     | Low                 | Normal     | High     |
| Male         | 0                   | 31         | 1        | 2                   | 26         | 4        |
| Female       | 2                   | 116        | 4        | 11                  | 107        | 4        |
| <b>Total</b> | <b>2</b>            | <b>147</b> | <b>5</b> | <b>13</b>           | <b>133</b> | <b>8</b> |

Most of the patients found normal results (T3 among 147 patients & T4 among 133 patients) while T3 level was low among 2 patients and high among 5 patients, similarly T4 results found low among 13 patients and high among 8 patients. It can be concluded that there is high prevalence of hypothyroidism than hyperthyroidism and female patients are suffered more from thyroid patients than male patients

Table 5. T3 and T4 level of patient tested according to caste

| Cast of patient | T3 level of patient |            |          | T4 level of patient |            |          |
|-----------------|---------------------|------------|----------|---------------------|------------|----------|
|                 | Low                 | Normal     | High     | Low                 | Normal     | High     |
| <b>Braman</b>   | 1                   | 26         | 1        | 1                   | 26         | 1        |
| <b>Chhetri</b>  | 0                   | 21         | 0        | 0                   | 20         | 1        |
| <b>Janajati</b> | 0                   | 8          | 1        | 1                   | 7          | 1        |
| <b>Dalit</b>    | 0                   | 6          | 0        | 1                   | 5          | 0        |
| <b>Madhesi</b>  | 0                   | 45         | 2        | 7                   | 36         | 4        |
| <b>Tharu</b>    | 0                   | 10         | 0        | 0                   | 9          | 1        |
| <b>Muslim</b>   | 1                   | 31         | 1        | 3                   | 30         | 0        |
| <b>Total</b>    | <b>2</b>            | <b>147</b> | <b>5</b> | <b>13</b>           | <b>133</b> | <b>8</b> |

In cast of the patients and TSH level, majority of the result found normal among cast. In context of TSH level low level was found among five patients of Braman, Janajati, Madhesi, Tharu and Muslims. Similarly high TSH value was found among 29 patients with more in Madhesi and less in Tharu casts. It can be concluded that there is high prevalence of hypothyroidism than hyperthyroidism in the community. In context of Thyroxine (T3) and Triiodothyronin (T4) level of patients, majority of the patients level of T3 and T4 found normal level. Similarly, most of the patients found high value of T3 and T4 and few of them found low level of T3 and T4 value. In addition to casts, high value of T3 and T4 found more in Madhesi and low T3 and T4 value found more in Madhesi cast. It is denoted that there is high prevalence of hypothyroidism and low prevalence of hyperthyroidism.

Table 6. TSH level of patients tested according to age group

| Age group of patient | TSH level of patients |            |           | Total      |
|----------------------|-----------------------|------------|-----------|------------|
|                      | Low                   | Normal     | High      |            |
| <21                  | 0                     | 18         | 2         | 20         |
| 21-40                | 4                     | 155        | 13        | 172        |
| 41-60                | 0                     | 70         | 10        | 80         |
| >61                  | 1                     | 22         | 4         | 27         |
| <b>Total</b>         | <b>5</b>              | <b>265</b> | <b>29</b> | <b>299</b> |

Most of them (29) found high value of TSH and few of them (5) found low level of TSH. Majority of the patients (13) of age group 21-40 have high value of TSH i.e. Hyperthyroidism and majority of low value were found among 21-40 years of age groups. It can be concluded that thyroid problem is affecting most of the public of 21-40 years age group.

## Discussion

The purpose of this study was to find out the prevalence of thyroid problems among patients tested in biochemistry laboratory of Siddharthanagar City Hospital Bhairahawa. The prevalence rate of thyroid problems in Siddharthanagar area was 10.21% in general public.

A study conducted in India among 2076 patients illustrated the overall prevalence of thyroid prevalence of 22.16% among all patients. In specific context, 4.24% were suffering from hypothyroid, 9.4% were suffering from sub-clinical hypothyroid, 2.5% were suffered from hyperthyroid and 5.97% were suffered from subclinical hyperthyroidism (Deokar et al., 2016). A retrospective study conducted in Gandaki medical college Pokhara among 2288 persons showed the 22.42% of thyroid disorders (Sharma et al., 2021). In addition to, a study conducted in biochemistry department of Dhulikhel Hospital-Kathmandu University Hospital (DU-KUH) among 825 public confirmed about 25% of subjects had thyroid problems including hypothyroidism 8% and hyperthyroidism 3% among general public. Highest prevalence was found among above 30 years group. Female were suffered more than male (Aryal et al., 2010). A hospital based study was conducted in Department of Radiology of Diabetes, Thyroid and Endocrinology Care Center Pokhara among 500 patients. The percentage of male and female were 14% and 86% respectively. The ages of study were 3-86 years. Among all, Hashimoto's thyroiditis was common and found more among female patients.

A study conducted in BP Koirala Institute of health sciences Dharan found the percentage of hypothyroidism and hyperthyroidism 17.19% and 13.68% respectively. The percent of male and female in context of hypothyroidism was 18% and 85% respectively. In addition to, the percentage of hyperthyroidism was equal i.e. 13% in both man and women. (Baral et al., 2002) A community based study was done in Dhulikhel community with history of weight gain found overall prevalence of thyroid disorder 26% and the ratio of male female was 1:5 between them. The result was primary hypothyroidism 8.85%, sub-clinical hypothyroidism 11.4% with primary hyperthyroidism 2.95% and secondary hyperthyroidism 2.76% respectively (Pradhan & Pradhan, 2017).

In this study, it has been observed that 299 reports of TSH and 154 reports of T3 and T4 tests provided by the Siddharthanagar City Hospital, Biochemistry Department. In context of TSH value was high (Hypothyroidism) among 29 patients during first quarter of FY 2078/79.

The overall prevalence of hypothyroidism was 9.69% during first quarter. In context of T3 and T4 test results, overall prevalence hyperthyroidism was 2.17% among all patients. Similarly, in context of T3 results, it was high in 1.7% and T4 result was high among 2.67% of total patients. The study done in Dhulikhel hospital showed higher (25%) of prevalence rate of Hypothyroidism but this study showed only 9.69% among tested. Both the studies showed high prevalence of thyroid problems among women groups. In context of study, done in Department of Radiology of diabetes, thyroid and endocrinology care center Pokhara, it is stated that there is difference in method of data collection, i.e. in basis of Radiology lab report and clinical laboratory reports. Another study done in BP Koirala Institute of health sciences showed high prevalence of hyperthyroidism.

In our study about TSH test among 299 lab reports, male was 65 (21.7%) and female was 234 (78.3%). This suggests that female population are suffering more than male population. Nearly similar percentage of result of gender was seen in a study done in Pokhara. (Sharma et al., 2021). In context of T3 and T4 tests among 154 lab reports, in T3 & T4 percentage of testing male and female was 32 (20.8%) and 122 (79.2%) respectively. In addition to, the percentage of hypothyroidism between male and female was 2.3 and 7.3 respectively. Similarly the percentage of hyperthyroidism between male and female was not similar in male participants i.e. T3 0.65, T4 2.6 and T3 and T4 report was

similar among female participants ie 2.6.

In our study, the number of persons from different casts is included. Among all participation of Madhesi cast in TSH test is more ie (97) 32% and followed by Brahman 57(19%) and Muslim 57(19%) respectively. The status of hypothyroidism was 9(3 %) in Madhesi and followed by Brahman 7(2.3%) and Muslim (1.7%) respectively. A study about awareness suggested that the level of knowledge about thyroid problem that the percentage of inadequate knowledge of thyroid problems was 41.8% among upper casts and 57.3% in Janajati and 52.8% among Dalit and minorities (Gyawali, 2019).

## Conclusion

The prevalence of thyroid problem is common. Hypothyroidism and hyperthyroidism are the main thyroid problems. Highest prevalence was found more in female population. The highest value of hypothyroidism was found among 21-40 years of age. Highest prevalence found among Madhesi followed by Brahman and Muslim casts. In context of hyperthyroidism, highest values were found among above 61 years of age followed by 21-40 years of age and found more in Madhesi among all public.

## Recommendations

- ✓ Thyroid functions tests should be done in time to time
- ✓ Community awareness and health education program should be conducted.
- ✓ Monitoring program should be conducted to identify proper use of Iodized salt
- ✓ Integrated approach should be carried out.
- ✓ Iodized salt intake should be implemented efficiently
- ✓ Expansion of thyroid test laboratories is crucial.

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