



## Research Article

# Status of Thyroid Function among Patients of National Medical College and Teaching Hospital

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### ABSTRACT

**Background:** Thyroid dysfunction is one of the most common endocrinopathies after Diabetes Mellitus. Thyroid dysfunction is defined as the alteration in Thyroid Stimulating Hormone (TSH) with normal or abnormal thyroid hormones. Nepalese population have a high risk for thyroid dysfunction with a high prevalence of iodine deficiency.

**Objective:** To study the prevalence of thyroid dysfunction among the patients visiting National Medical College, Birgunj, Nepal for checkup and suggested to assess thyroid function.

**Materials and Methods:** The hospital-based study was conducted in Central Laboratory, National Medical College and Teaching Hospital (NMCTH), Birgunj in collaboration

with the Department of Biochemistry. Total 7040 patients visiting Central Laboratory for thyroid function assessment were included in the study between July 2017 to December 2019. The venous blood sample was collected and serum-free triiodothyronine (fT3), free tetraiodothyronine (fT4) and thyroid stimulating hormone (TSH) was estimated by Chemiluminescence Immunoassay (CLIA) method using Access 2 Beckman Coulter analyser. (Beckman Coulter Inc., California, USA).

**Results:** Among 7040 subjects under study, 2138(30%) were found to have thyroid dysfunction with 13% having subclinical hypothyroidism, about 8% of overt hypothyroidism, about 4% with subclinical hyperthyroidism and 5% with overt hyperthyroidism. Majority of the thyroid

dysfunction study group belonged to the 16-30 years age group followed by 31-45 years. Mean $\pm$ SE for TSH, fT4 and fT3 levels show statistically significant differences in different thyroid disorders.

**Conclusion:** The study revealed a high prevalence of subclinical hypothyroidism followed by overt hypothyroidism among the patients visiting National Medical College and Teaching Hospital, Birgunj, Nepal. A higher percentage of females were found to have thyroid dysfunction compared to male.

**Keywords:** Hyperthyroidism, Hypothyroidism, Thyroid dysfunction, Thyroid hormones.

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## INTRODUCTION

Thyroid dysfunction is one of the most common endocrinopathies after Diabetes Mellitus.<sup>1</sup> Thyroid dysfunction is defined as the alteration in Thyroid Stimulating Hormone (TSH) with normal or abnormal thyroid hormones (triiodothyronine and tetraiodothyronine).<sup>2</sup> With decreased or increased thyroid hormones in the blood, thyroid dysfunction is categorized as hypothyroidism or hyperthyroidism, respectively. In case of subclinical thyroid dysfunction where the level of thyroid hormones is normal, the level of TSH determines the nature of thyroid dysfunction. Serum TSH with free or total thyroid hormones is commonly used to screen and monitor thyroid disorders. The American Thyroid Association recommends that adults be screened for thyroid dysfunction by measurement of the serum thyrotropin

concentration, beginning at age 35 years and every 5 years thereafter.<sup>2,3</sup>

Globally thyroid dysfunction affects about 300 million people and more than half are supposed to be unaware of their condition.<sup>4</sup> There is no such study to our knowledge that documents prevalence of thyroid disorder of Nepal. However, several studies showed the prevalence of thyroid dysfunction in various region of Nepal. The prevalence of thyroid disorder was 30% in eastern Nepal (Baral N et al., 2002) and 17.42% in western Nepal (Risal P et al. 2010).<sup>5,6</sup> Prevalence of thyroid dysfunction in the central and far-western region was 29% and 33.6% respectively.<sup>7,8</sup>

Nepalese population have a high risk for thyroid dysfunction with a high prevalence of iodine deficiency.<sup>9</sup> Apart from iodine deficiency, several factors are responsible for exacerbating the thyroid dysfunction in the context of Nepal.<sup>2</sup> The study conducted for 3 years by Gupta RK et al. (2009 to 2012) at National Medical College, Birgunj, Nepal showed the prevalence of overt and subclinical hyperthyroidism.<sup>10</sup> As best to our knowledge there are no such epidemiological records that depict the overall status of thyroid dysfunction in National Medical College, Birgunj, Nepal. This study aims to document the prevalence of thyroid dysfunction in populations of Province Two, visiting National Medical College and Teaching Hospital, Birgunj, Nepal.

## MATERIALS AND METHODS

**Data collection:** The study was carried out using data retrieved from the register maintained in the Central Laboratory Services (CLS) of the National Medical College and Teaching Hospital, Birgunj between July 2017 to December 2019. Over this period, a total of 7040 patients underwent assessment

of thyroid function. The variables collected were age, sex, and thyroid function profile including free triiodothyronine (fT3), free tetraiodothyronine (fT4) and Thyroid Stimulating Hormone (TSH). The study was approved by an Institutional Review Committee (IRC) of National Medical College and Teaching Hospital, Birgunj, Nepal.

**Collection of blood samples:** Venous blood sample (2-3 ml) was collected from the antecubital vein in a plain vial, and was allowed to clot, then subsequently serum was separated by centrifugation at 3000g for 10 minutes and thyroid function test was performed. Samples which were not possible to process within regular lab hours were stored at 4°C until TSH and free thyroid hormones were estimated.

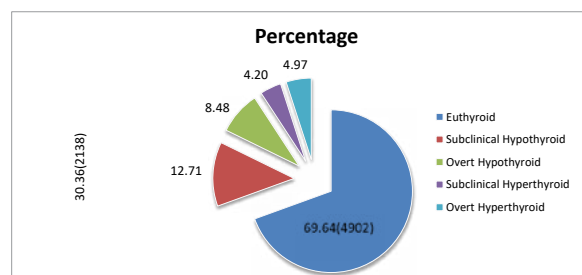
**Assay procedure for thyroid hormones:** Thyroid hormones (fT3 and fT4) and TSH were estimated by Chemiluminescence Immunoassay (CLIA) method using Access 2 Beckman Coulter analyser. (Beckman Coulter Inc., California, USA). The reference ranges for TSH, fT4 and fT3 were 0.34 -5.6  $\mu$ IU/mL, 6.1-11.2pg/mL and 2.5 -3.9pg/mL, respectively. Individuals who had all three hormones within the reference range were considered euthyroid. Study groups with abnormal thyroid functions were further categorized as subclinical hypothyroidism (normal fT4 and fT3 with increased TSH), overt hypothyroidism (decreased fT4 and fT3 with increased TSH), subclinical hyperthyroidism (normal fT4 and fT3 with decreased TSH) and overt

hyperthyroidism (increased fT4 and fT3 with decreased TSH)<sup>11,12</sup>

## STATISTICAL ANALYSIS

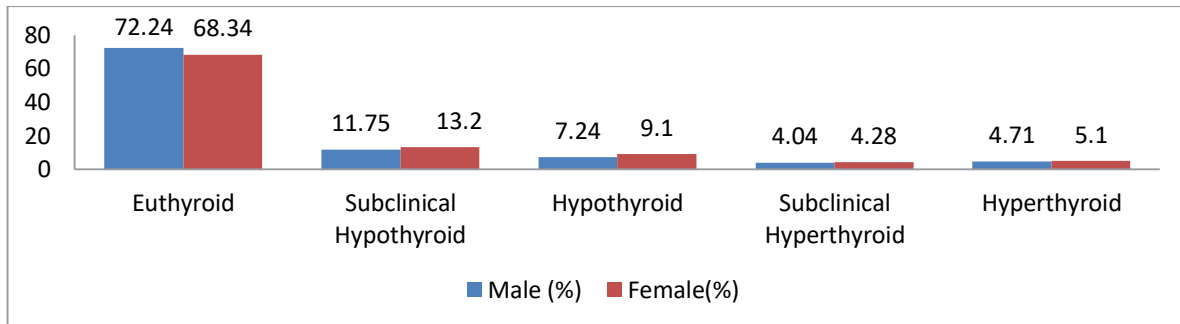
The data entered in MS Excel 2010 and analyzed by Statistical Package for Social Science (SPSS) version 16.0 (SPCC Inc. Chicago). Descriptive and inferential statistics were applied. Data were presented as frequency, percentage and mean  $\pm$ SE. The ANOVA test was applied to check the significant difference of variables between each group. P-value <0.05 (at 95% confidence interval) was considered statistically significant.

## RESULTS:



**Figure 1: Status of thyroid functions in the study group**

In this study total of 7040 individuals underwent for assessment of thyroid function. Figure 1 represents the prevalence of thyroid status in the population of province 2 visiting National Medical College and Teaching hospital. Overall 2138 (30.36%) were found to have thyroid dysfunction with subclinical hypothyroidism (12.71%), overt hypothyroidism (8.48%), subclinical hyperthyroidism (4.20%) and overt hyperthyroidism (4.97%).



**Figure 2: Gender wise distribution of thyroid function**

Figure 2 represents the gender-wise distribution of thyroid function. Among the study group, 4666 (66.28%) were females and 2374 (33.72%) were males. Overall, females were more prevalent to all 4 types of thyroid dysfunction compared to males. In this study percentage of males and females having thyroid dysfunction was 27.74% and

31.68%, respectively. Hypothyroidism was observed in 18.99% of males and 22.3% of female. In this study 8.75% and 9.38% of hyperthyroidism was observed in males and females respectively. In comparison to the other thyroid dysfunction higher percentage of females (13.2%) and males (11.75%) were found to have subclinical hypothyroidism.

**Table 1: Distribution of Thyroid function according to age groups**

Thyroid status	Age(Years)					Total
	≤15	16-30	31-45	46-60	≥61	
<b>Euthyroid</b>	295 (73.02%)	1750 (68.60%)	1360 (70.47%)	1015 (71.83%)	482 (64.96%)	4902
<b>Subclinical hypothyroid</b>	52 (12.87%)	341 (13.37%)	240 (12.44%)	166 (11.75%)	96 (12.94%)	895
<b>Hypothyroid</b>	31 (7.67%)	224 (8.78%)	168 (8.70%)	108 (7.64%)	66 (8.89%)	597
<b>Subclinical hyperthyroid</b>	12 (2.97%)	101 (3.96%)	73 (3.78%)	65 (4.60%)	45 (6.06%)	296
<b>Hyperthyroid</b>	14 (3.47%)	135 (5.29%)	89 (4.61%)	59 (4.18%)	53 (7.14%)	350
<b>Total</b>	404	2551	1930	1413	742	7040

**Table 2: Comparison of thyroid function test values among different thyroid status group**

Thyroid function test	Euthyroid (Mean±SE)	Subclinical Hypothyroid (Mean±SE)	Overt Hypothyroid (Mean±SE)	Subclinical hyperthyroid (Mean±SE)	Hyperthyroid (Mean±SE)	P-value
TSH	2.43±1.12	10.7±0.33	41.70±3.33	0.23±0.01	0.14±0.03	<0.001
ft4	10.19±0.21	8.21±0.40	2.21±0.12	11.02±0.24	25.65±0.40	
FT3	2.90±0.31	2.04±0.43	0.90±0.16	3.21±0.38	7.08±0.25	

Majority of the thyroid dysfunction study group belonged to the 16-30 years age group followed by the 31-45 years age group. In all age groups, Subclinical hypothyroidism and hypothyroidism was highly prevalent compared to other thyroid dysfunctions.

The ANOVA test was applied to check the significant difference of variables between each group. All three hormones were significantly different in various groups of thyroid dysfunction.

## DISCUSSION

The prevalence of thyroid dysfunction observed in the present study was 30.36% in the patients visiting the National Medical College and Teaching Hospital due to various reasons and was suspected of thyroid dysfunction. Similar hospital-based studies were conducted in various part of Nepal and obtained various results. Baral et al. reported 30% thyroid disorder among the population of Eastern Nepal<sup>5</sup>, Yadav NK et al. found 33.66% in far-western part of Nepal<sup>8</sup>, Mahato RV documented 29% thyroid disorder in central (Kathmandu) Nepal<sup>7</sup> and Aryal M et al. recorded 25% in Kavre<sup>2</sup> and Dangol RK estimated 23.31% in Lumbini Medical College<sup>1</sup>. Various factors such as age, gender, ethnicity, geography, and iodine intake status might have contributed in variation in prevalence as mentioned in other studies.<sup>12,13</sup>

In our study gender-wise distribution of thyroid dysfunction was 27.71% and 31.68% in male and female, respectively. The study conducted by Aryal M et al.<sup>2</sup> showed that a significantly higher percentage of female suffer from thyroid disorder than male. However, result contrasted with the finding of Baral N et al.<sup>5</sup> and Risal P et al. (2010)<sup>6</sup>.

In this study, the prevalence of total

hypothyroidism was 21.19% (12.71% subclinical and 8.48% overt hypothyroidism). Among hypothyroid population higher percentage were found to have subclinical hypothyroidism which is similar to different studies.<sup>1,2,7,8</sup> Mahato RV et al. reported 25% hypothyroid (17% subclinical and 8% overt hypothyroidism) among the population of central (Kathmandu) Nepal which is near to our finding<sup>7</sup>. Our finding is similar to most of the studies conducted in a different region of Nepal which recorded increased prevalence of hypothyroidism over hyperthyroidism.<sup>13,14,15</sup> Large group of population is found to have hypothyroidism compared to other thyroid disorder.<sup>16,17</sup> Iodine deficiency may be one of the major cause of hypothyroidism in the Nepalese population as mentioned in various studies.<sup>16</sup> Our study showed total hypothyroidism (subclinical and overt) in 22.3% of females and 18.99% of males. Hypothyroidism and hyperthyroidism are more common in females than in males.<sup>17</sup> The reason may be due to hormonal change, such as during or after pregnancy or after menopause. Sex hormones, especially estrogen and prolactin, have an important role in modulating the immune system and may impact autoimmune disease. Hashimoto's thyroiditis is another major cause of hypothyroidism which is more common in females.<sup>18</sup>

Hyperthyroidism was reported in 9.17% (including 4.20% of subclinical and 4.97% overt hyperthyroidism) of study population visiting National Medical College and Teaching Hospital. It is supported by Dangol RK et al.<sup>1</sup> and Aryal M et al.<sup>2</sup> who showed 9.76% and 9% of hyperthyroid, respectively. In contrast to our finding, Gupta Rk et al.<sup>10</sup> reported 23.09% cases of hyperthyroidism among the population visiting National

Medical College and Teaching Hospital, Birgunj, Nepal between 2009 to 2012. In this study, the prevalence of hyperthyroidism (subclinical and overt) in male and female was 8.75% and 9.38%, respectively. Different studies showed a high prevalence of hyperthyroidism in women compared to men.<sup>2,10,19</sup>

Among all age groups, thyroid disorder was more prevalent in the 16 to 30 years age category followed by 31 to 45 years age category. However, a study conducted by Dangol RK et al.<sup>1</sup>, Mahato et al.<sup>7</sup> and Aryal M et al.<sup>2</sup> observed high prevalence in the 31 to 45 years age category. Several studies have revealed that the incidence of thyroid increases with advancing age<sup>15,20,21</sup>. The American Thyroid Association also recommends that adult be screened for thyroid dysfunction by measurement of the serum thyrotropin concentration, beginning at age 35 years and every 5 years thereafter.<sup>3</sup>

In this study mean±SE for TSH, fT4 and fT3 levels show statistically significant differences in different thyroid disorders. Similar results were obtained by Yadav NK et al.<sup>8</sup> and Mahato RV et al.<sup>7</sup> In another study by Aryal M et al.<sup>2</sup>, fT3 and TSH were significantly different in various groups of thyroid dysfunction but free T4 level was statistically insignificant.

## CONCLUSION

The study documented a high prevalence of subclinical hypothyroidism followed by overt hypothyroidism among the patients visiting National Medical College and Teaching Hospital, Birgunj, Nepal. Best to our knowledge this is the first study to record the prevalence of all forms of thyroid dysfunction of the population in province 2. However, it is a hospital-based study and therefore does not represent the epidemiological study of

an entire province. The study recommends proper screening, treatment and finding the etiology of all forms of thyroid dysfunctions in this region.

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**Conflicts of Interest:** The authors declare no any conflict of interest.

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