

## **Original Article**

### **Assessment of Thyroid Disorder in Far Western Part of Nepal: A Hospital Based Study**

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#### **Abstract**

**Objectives:** This study was conducted to know the status of thyroid disorder in people of far western region of Nepal. **Methods:** A total of 808 cases, out of which 133 male and 675 female were included and study was carried out using data retrieved from the register maintained in the Department of Biochemistry of the Nepalgunj Teaching Hospital, Kohalpur, Banke, Nepal, between 1<sup>st</sup> January, 2011 and 28<sup>th</sup> February, 2012. The variables collected were age, sex, and thyroid function profile including free T3, free T4 and TSH. The data was analyzed using Excel 2003, R 2.8.0 Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and the EPI Info 3.5.1 Windows Version. **Results:** The percentage of thyroid disorders was 33.66% in people of far western region of Nepal. The people were highly affected by overt hyperthyroidism (14.9%) followed by subclinical hyperthyroidism (9.9%). The subclinical hypothyroidism was 7.9% while 1% overt hypothyroidism only. Serum fT3, fT4 and TSH level were significantly different in male and females. Similarly, fT3, fT4 and TSH levels show statistically significant differences in different thyroid disorders. The fT3 and fT4 level in overt hyperthyroidism and subclinical hypothyroidism showed statistically significant differences when compared with euthyroidism group. Likewise, TSH level also shows statistically significant in all the thyroid disorders when compared with euthyroidism group. The fT3 and fT4 levels were statistically insignificant in all the age groups whereas TSH level showed statistically significant different in all the age groups. The fT3 and fT4 level in 21-40 years showed statistically significant when compared with serum level of fT3 and fT4 of 0-20 years. Similarly, serum level of TSH in 21-40 and 41-60 years also showed statistically significant when compared with serum level of TSH of 0-20 years. **Conclusion:** The people residing in far western region have risk for thyroid disorders. They were suffering with thyroid disorder, especially overt hyperthyroidism (14.9%) and subclinical hyperthyroidism (9.9%). Further studies are required to characterize the reasons for this high prevalence of overt hyperthyroidism and subclinical hyperthyroidism.

**Key words:** Free T3, Free T4, TSH, Hyperthyroidism, Hypothyroidism, Nepal

#### **Introduction**

Thyroid disorder is one of the most commonly encountered endocrine abnormalities and affects the amount of thyroid hormones being produced. Excess production leads to hyperthyroidism while diminished production leads to hypothyroidism<sup>1</sup>. The incidence of hypothyroidism and hyperthyroidism in women is 4.98/1000 and 0.77/ 1000 per year, but is much lower in men 0.88/1000 and 0.14/1000 per year respectively<sup>2</sup>. Thyroid disorders are categorized into four groups (overt and subclinical hyperthyroidism, overt and subclinical hypothyroidism) depending upon the level of thyroid hormones and

TSH. Subclinical hypothyroidism show elevated serum TSH levels with normal levels of serum fT4 and fT3 and is a more common disorder than overt hypothyroidism with a prevalence of 1.4–7.8% in older populations and even greater percentiles among women<sup>3</sup>. The majority of thyroid disorders were seen in the 21-40 years age group. Thyroid disorder is a major public health problem among the local population in Eastern Nepal<sup>4</sup>. Another study showed, the people of Nepal have high risk for thyroid dysfunction with its high prevalence of iodine deficiency disorder<sup>5</sup>. It indicates people of far western region may have risk of thyroid disorder. To the

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best of our knowledge no studies have been done to estimate the percentage of thyroid disorder in far western part of Nepal. Therefore, the aim of the present study was to determine the situation of thyroid disorder in far western people of Nepal.

### Materials and Methods

A total of 808 cases (133 men and 675 non pregnant women) from the far western eastern part of Nepal who attended the thyroid clinic of Nepalgunj Teaching Hospital, Kohalpur, Banke, Nepal in order to have their Thyroid function tests done at Nepalgunj Teaching Hospital were included in the study.

The study was carried out using data retrieved from the register maintained in the Department of Biochemistry of the Nepalgunj Teaching Hospital between 1<sup>st</sup> January, 2011 and 28<sup>th</sup> February, 2012. The variables collected were age, sex, and thyroid function profile including free T3, free T4 and TSH. Ethical approval for the study was taken from the institutional research ethical committee. The estimation of serum free T3, free T4 and TSH were made by the enzyme immunoassay method, using Randox kits (Randox Laboratories Ltd, Ardmore, UK). The internal quality control was included in each batch of tests performed.

The data collected was analyzed using Excel 2003, R 2.8.0 Statistical Package for the Social Sciences (SPSS) for Windows Version 16.0 (SPSS Inc; Chicago, IL, USA) and EPI Info 3.5.1 Windows Version. The t-test and ANOVA was used to observe

the relationship between different variables.  $p < 0.05$  is considered as statistically significant.

### Results:

**Table I: Shows the percentage distribution of thyroid disorders**

Thyroid status	Frequency	Percentage	95% CI	
			Lower	Upper
Euthyroidism	536	66.3	62.9	69.6
Overt Hyperthyroidism	120	14.9	12.5	17.5
Subclinical hyperthyroidism	80	9.9	8.0	12.2
Overt hypothyroidism	8	1.0	0.5	2.0
Subclinical hypothyroidism	64	7.9	6.2	10.1

*Table I: Shows the status of thyroid disorders in the studied population. The percentage of thyroid disorders was 33.66%. The people were highly affected by overt hyperthyroidism (14.9%) followed by subclinical hyperthyroidism (9.9%). The percentage of subclinical hypothyroidism was 7.9% while 1% overt hypothyroidism only in a far western region of Nepal.*

**Table II: Comparison of thyroid hormones level in males and females**

Thyroid hormones	Male (mean ± SD)	Female (mean ± SD)	P value
fT3 (pg/ml) 95% CI	2.15 ± 0.67 (2.03, 2.26)	4.57 ± 5.32 (4.17, 4.97)	□ 0.001
fT4 (ng/dl) 95% CI	1.29 ± 0.35 (1.23, 1.35)	2.09 ± 1.8 (1.90, 2.19)	□ 0.001
TSH (IU/ml) 95% CI	4.61 ± 6.98 (3.41, 5.80)	2.60 ± 5.12 (2.22, 2.99)	□ 0.001

*Table II: Shows the comparison of level of thyroid hormones in males and females. Serum fT3, fT4 and TSH level were significantly different in male and females.*

**Table III: Comparison of thyroid hormones level among different thyroid disorders**

Thyroid hormones	Euthyroidism	Overt hyperthyroidism	Subclinical hyperthyroidism	Overt hypothyroidism	Subclinical hypothyroidism	P value
fT3 (pg/ml) 95% CI	2.44 ± 1.14 (2.35, 2.54)	14.54 ± 5.68† (13.51, 15.57)	2.36 ± 0.87 (2.16, 2.55)	1.47 ± 0.22 (1.29, 1.65)	1.81 ± 0.61† (1.66, 1.96)	0.0001* *
fT4 (ng/dl) 95% CI	1.34 ± 0.42 (1.30, 1.38)	5.40 ± 2.22† (5.00, 5.80)	1.46 ± 0.47 (1.35, 1.56)	0.86 ± 0.23 (0.66, 1.06)	0.98 ± 0.31† (0.90, 1.06)	0.0001* *
TSH (IU/ml) 95% CI	2.06 ± 1.49 (1.94, 2.19)	0.13 ± 0.14† (0.10, 0.16)	0.07 ± 0.10† (0.05, 0.09)	9.72 ± 0.92† (8.95, 10.48)	18.21 ± 9.81† (15.75, 20.66)	0.0001* *

†  $p < 0.05$ . Statistically significant when compared to Euthyroidism\*\*  $p < 0.001$ . Statistically significant.

*Table III: Shows the comparison of thyroid hormone levels among different thyroid disorders. Serum fT3, fT4 and TSH levels show statistically significant differences in different thyroid disorders. The serum fT3 and fT4 level of overt hyperthyroidism and subclinical hypothyroidism showed statistically significant differences when compared with serum fT3 and fT4 level of euthyroidism group. Similarly, serum TSH level shows statistically significant in all the thyroid disorders when compared with serum TSH level of euthyroidism group.*

**Table IV: Comparison of thyroid hormones level among different age group**

Thyroid hormones	0-20 years	21-40 years	41-60 years	More than 60 years	P value
ft3 (pg/ml) 95% CI	3.44 ± 3.86 (2.84, 4.04)	4.46 ± 5.22† (3.97, 4.95)	4.16 ± 5.17 (3.44, 4.90)	3.73 ± 3.68 (1.76, 5.69)	0.163
ft4 (ng/dl) 95% CI	1.68 ± 1.37 (1.47, 1.90)	2.01 ± 1.85† (1.84, 2.18)	1.92 ± 1.73 (1.67, 2.16)	1.87 ± 1.55 (1.05, 2.70)	0.238
TSH (IU/ml) 95% CI	3.93 ± 7.20 (2.80, 5.05)	2.78 ± 5.39† (2.27, 3.28)	2.31 ± 3.60† (1.80, 2.82)	4.83 ± 7.37 (0.90, 8.76)	0.019*

†  $p < 0.05$ . Statistically significant when compared to Euthyroidism \*  $p < 0.05$ . Statistically significant.

Table IV: Represents the comparison of thyroid hormones level among different age group. The serum ft3 and ft4 levels were statistically insignificant in all the age groups whereas serum TSH level showed statistically significant different in all the age groups. The serum ft3 and ft4 level in 21-40 years showed statistically significant when compared with serum level of ft3 and ft4 of 0-20 years. Similarly, serum level of TSH in 21-40 and 41-60 years also showed statistically significant when compared with serum level of TSH of 0-20 years.

### **Discussion:**

Thyroid disorder is the major health problem associated with endocrine abnormalities worldwide. The present study showed thyroid disorders (33.66%) were high in far western part of Nepal. The similar study reported nearly 30% of the populations were suffering from thyroid dysfunction in eastern part<sup>4</sup> and 25% thyroid dysfunction in population of Kavre, Nepal<sup>6</sup>.

The overall hypothyroidism was 8.9% (1% overt hypothyroidism and 7.9% subclinical hypothyroidism) in this study is supported by Usha et al, reported 3.9% hypothyroidism and 9.4% subclinical hypothyroidism<sup>7</sup>. The another study showed, overall prevalence of both overt and subclinical hypothyroidism was slightly, but not significantly, lower than that recalculated from the Whickham survey (0.5% and 5.3%, respectively)<sup>8,9,10</sup>. Similar study from Pakistan by Akhtar et al reported 4.0% hypothyroidism and 5.4% subclinical hypothyroidism in thyroid patients<sup>11</sup>.

The prevalence of total hyperthyroidism was 24.8% including both overt hyperthyroidism (14.9%) and subclinical hyperthyroidism (9.9%) in this study. Akhtar et al reported that hyperthyroidism (5.1%) and subclinical hyperthyroidism (5.85%) in all age groups<sup>11</sup>. In an epidemiological survey from Cochin, subclinical and overt hyperthyroidism was present in 1.6% and 1.3% of subjects respectively<sup>7</sup>. Gomez et al reported 58.2% had hyperthyroidism (53.1% of which were T4 thyrotoxicosis, 12.5% T3 thyrotoxicosis and 34.4% had subclinical hyperthy-

roidism) and 8.2% of patients had iodine induced hyperthyroidism<sup>12</sup>. A hospital-based study of women from Pondicherry, subclinical and overt hyperthyroidism was present in 0.6% and 1.2% of subjects respectively<sup>13</sup>. Similarly, a hospital based study from kavre, Nepal reported total hyperthyroidism was 9% including both 6% subclinical hyperthyroidism and 3% hyperthyroidism<sup>6</sup>. The possible reasons for such high number of hyperthyroidism cases in far western region of Nepal may be: the selection bias of a hospital-based study, the functional autonomy of thyroid in endemic goiter cases, the poorly monitored iodized salt supply program in Nepal - excessive iodized salt may also cause thyrotoxicosis<sup>14</sup>.

In this study, mean ft3, ft4 and TSH level were significantly different in male and females. Similar study showed, ft3 and ft4 levels were significantly different in males and females whereas the mean TSH level in the male was higher than female but it was statistically insignificant<sup>6</sup>.

The mean ft3, ft4 and TSH levels show statistically significant differences in different thyroid disorders in this study. Aryal et al reported, ft3 and TSH were significantly different in various groups of thyroid dysfunction but ft4 level was statistically insignificant<sup>6</sup>.

The mean ft3 and ft4 levels were statistically insignificant in all the age groups whereas serum TSH level showed statistically significant different in all the age groups in our study.

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### **Conclusion:**

The people residing in far western region have risk for thyroid disorders. They were suffering with thyroid disorder, especially overt hyperthyroidism (14.9%) and subclinical hyperthyroidism (9.9%). Further studies are required to characterize the rea-

sons for this high prevalence of overt hyperthyroidism and subclinical hyperthyroidism. The people are required to educate regarding the thyroid dysfunction cause and prevention methods to minimize the occurrence of thyroid disorders.

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