

# Ethnic differences in the Prevalence of Thyroid disorders among population of Far Western Region of Nepal

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## ABSTRACT

**Introduction:** Thyroid disorder is second most common endocrine disorder after diabetes in the world. The burden of thyroid diseases in the general population is enormous especially in females. The aim of this paper is to study the prevalence of thyroid disorders among population of Far Western Region.

**Methods:** The present work was conducted to study the ethnic differences in the prevalence of thyroid disorders in patients who attended the Life Care Diagnostics and Research Center Pvt. Ltd. Dhangadhi. Total of 1000 patients suspected with thyroid disorders were enrolled in this study. The incidence of thyroid disorders and its relationship with the different ethnic, age groups and gender were investigated.

**Results:** Out of 1000 patients with suspected thyroid dysfunction, 65.8 % were euthyroid followed by 13.8 % of patients having subclinical hypothyroidism, 9.5% hyperthyroidism and 7.9 % hypothyroidism. The incidence subclinical hyperthyroidism 3.0% was lowest. Hypothyroidism was the most common thyroid disorders among ethnic groups, Chhetri 37.97 % and Brahmin 40.57 %. In addition, females were most affected among the population.

**Conclusion:** The prevalence of thyroid disorders in Far western population showed difference among different ethnic group. Public awareness of thyroid disorders and their potential complications could lead to improved diagnostic and therapeutic facilities. anti-snake venom.

**Keywords:** ethnic group; subclinical hyperthyroidism; subclinical hyperthyroidism

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## INTRODUCTION

Thyroid disorders are, arguably, among the most prevalent endocrine disorders around the globe other than diabetes mellitus.<sup>1</sup> The most prevailing root of thyroid derangements worldwide is iodine deficiency and almost one-third of the world's population lives in the region of iodine inadequacy<sup>2</sup>. The burden of thyroid disease in the general population is enormous. Thyroid disorder is one of the major health issue in general population of Nepal and the number of thyroid patients are increasing day by day, with its prevalence of about 30%<sup>3,4</sup>. Approximately, 0.2% of death has been reported in Nepal results from endocrine disorders. Among which iodine insufficiency has been major cause (World Health Organization., 2001).<sup>5</sup> Even though the high prevalence of thyroid disorders, screening for these disorders is not favored by any main health department.

The Himalayan strip is one of the very extreme endemic parts for iodine deficiency condition.<sup>6,7</sup> Nepalese population is at higher risk for thyroid dysfunction due to geographical locations with high hilly areas with higher prevalence of iodine deficiency disorders.<sup>8,9</sup> Geographically, Nepal is divided into three ecological zones (Mountain, Hills and Terai), and culture is diverse, encompassing several ethnic sub-groups together with a number of different languages and religions. Nepal is composed of 125 caste/ethnic communities as mentioned in the 2011 census (CBS, 2012). Ethnic communities are grouped into 8 broad important groups Chhetri, Bahun, Hill Janajati, Terai Janajati, Terai different castes, Hill Dalit, Terai Dalit and Muslim. The ethnic communities have unique biological and genetic barrier.<sup>10</sup> Because of these potential biological differences, genetic factors may be relevant to any ethnic comparison within Nepal. Geographically Kailali in Far western part of Nepal is located in the

foothills of the Himalayas and made up of terai (flat lands). 40 % of the land is covered by plain terai land 60 % is covered by hills of Chure range. In places where the day-to-day iodine consumption is under 50 µg, goiter is usually endemic, and once the everyday consumption comes under 25µg, hypothyroidism is seen. However, the prevalence and the pattern of thyroid disorders depend on ethnic and geographical factors, environmental factors and especially on iodine intake.<sup>11</sup> Ethnic variation in prevalence may possibly reflect variations in genetic susceptibility due to polymorphisms or variations in environmental exposures (e.g., environmental contaminants).

Thyroid diseases are multifactorial with contributions from genetic and environmental factors.<sup>12</sup> Thyroid dysfunction is usually acquired and may occur any time in life and is one of the chronic noncommunicable diseases affecting women more than men. Hypothyroidism and hyperthyroidism are two main thyroid disorders of which hypothyroidism are much more common.<sup>13</sup> The prevalence status of hyperthyroidism (13.68%) and hypothyroidism (17.19%) were studied in the eastern part of Nepal. These disorders are 8 times more common in females than males.<sup>14</sup> The actual reason is not known. The higher prevalence in females might be due to| estrogen and progesterone.<sup>15</sup> Furthermore, hypothyroidism may cause osteoporosis, hyperlipidemia and neuropsychiatry condition in the population.<sup>16</sup>

The thyroid hormones often referred as the major metabolic hormones; affect virtually every cell in the body. Thyroid disorder is defined as the abnormal thyroid stimulating hormones (TSH) with normal or abnormal thyroid hormones, free triiodothyronine (f T3) and free tetraiodothyronine(fT4).<sup>14</sup> The most common cause of thyroid dysfunction is a primary failure of thyroid gland, pituitary dysfunction, hypothalamic

dysfunction or generalized tissue resistance to the circulatory thyroid hormones. Both hypothyroidism and hyperthyroidism have been linked with increased risk from cardiovascular disease and the adverse effects of thyrotoxicosis in terms of osteoporosis risk are well established. The seriousness of thyroid disorders should not be underestimated as thyroid storm and myxedema coma can lead to death in a significant number of cases.<sup>17</sup> Virtually all studies report higher prevalence rates for hypothyroidism in women and with advancing age, with rates as high as 24% among women older than 60 years.<sup>18</sup> Thyroid dysfunction is prevalent in pregnant women, with a morbidity of 2–3%; it is caused by chronic autoimmune thyroiditis. The thyroid hormones frequently known as the important metabolic hormone, practically influence every cell in the body. Thyroid disorder is explained as the abnormal thyroid stimulating hormones (TSH) with normal or abnormal thyroid hormones, free tri-iodothyronine (f T3) and free tetra-iodothyronine (fT4).<sup>14</sup> The most frequent reason behind thyroid dysfunction is a primary failure of the thyroid gland, pituitary dysfunction, hypothalamic dysfunction or generalized tissue resistance to the circulatory thyroid hormones. Hypothyroidism and hyperthyroidism have already been associated with increased risk from cardiovascular disease and the adverse effects of thyrotoxicosis with regards to osteoporosis risk are effectively established. The seriousness of thyroid problems should not be overlooked as thyroid storm and myxedema coma may result in death in a substantial number of cases.<sup>17</sup> Almost all reports record higher prevalence rates for hypothyroidism in women and with developing era, with rates as high as 24% among women over the age of 60 years.<sup>18</sup> Thyroid dysfunction is common in pregnant women, with a morbidity of 2–3%; it is due to chronic autoimmune thyroiditis.<sup>19</sup>

The newborn may also be affected by hypothyroidism, which leads to irreversible mental and physical retardation if not identified early and treated properly.<sup>20</sup>

There is too little reliable and representative information on the prevalence of different types of thyroid disorders in Nepal. Numerous small studies from various parts of the nation carried out on the varied populations demonstrate different prevalence rates.<sup>11-13</sup> Till now, these are no data reported regarding prevalence of thyroid disorders from Far western population of Nepal and this is the first study which is being reported from this region. There is much to learn about these disorders and their prevalence and their impact on health. So, early medical diagnosis along with treatment remains to be the essence of the management. Therefore, the investigation was designed along with an objective in order to measure the prevalence associated with thyroid disorder within the far western region of Nepal.

## METHODS

Total 1,000 cases of suspected thyroid disorders of both the sexes of varying age groups ranging from one year to eighty years from Dhangadhi, Kailali district of the Far Western Region were included in the study. This study was conducted in the specialized diagnostic center of Dhangadhi, Nepal from September, 2016 to March, 2017. All the patients suspected of thyroid disorders were screened for thyroid function after obtaining consent from all the patients. 5 ml of blood sample was collected and centrifuged at 3000 rpm for 15 minutes for serum separation. Thyroid function was assessed by quantitative estimation of fT3, fT4 and TSH levels in serum performed using fully automated immunology analyzer (Beckman coulter, access 2, USA) based on Chemiluminescent Immuno Assay (CLIA).

The reference interval for fT<sub>3</sub>, fT<sub>4</sub> and TSH were 2.30-4.20 pg/ml, 0.61-1.12 ng/dl and 0.35-5.50 mIU/L respectively. Thyroid function is considered normal (Euthyroidism) when subjects were presented with normal fT<sub>3</sub>, fT<sub>4</sub> and TSH. Abnormal thyroid function was further categorized as hyperthyroid (high fT<sub>3</sub>, fT<sub>4</sub> and low TSH), subclinical hyperthyroid (Normal fT<sub>3</sub>, fT<sub>4</sub> and Low TSH), hypothyroidism (low fT<sub>3</sub>, fT<sub>4</sub> and high TSH), and subclinical hypothyroidism (Normal fT<sub>3</sub>, fT<sub>4</sub> and high TSH).

Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) version 20.0. The data were represented as counts, percentage and mean  $\pm$  standard deviation. Data were considered significant at  $P < 0.05$ .

## RESULTS

A total of 1000 patients were enrolled into the study among whom 81.4% (n=814) were females and 18.6% (n=186) were males. The sex-wise analysis of these subjects is compared in **Table 1**. The ratio of female to male is around 4.3:1 in this study. The mean FT<sub>4</sub> level in male and female group were 0.913 $\pm$ 0.65 and 0.85 $\pm$ 0.52 pg/ml respectively which is statistically significant ( $P=0.043$ ). However, FT<sub>3</sub> (3.9312 $\pm$ 2.39 and 3.74 $\pm$ 2.4 pg/ml,  $P= 0.214$ ) and TSH (8.499 $\pm$ 24.15 and 8.81 $\pm$ 24.74  $\mu$ IU/ml;  $P= 0.879$ ) were did not show any significant difference in both groups.

All the patients enrolled in this group were divided into different ethnic groups like Brahmin, Chhetri, Thakuri, Tharu, Rana, Newar and others. The

**Table 1:** Prevalence of thyroid dysfunctions in Male and Female groups

Thyroid Hormones	Male (Mean $\pm$ SD)	Female (Mean $\pm$ SD)	P value
Free T3 (pg / ml)	3.9312 $\pm$ 2.39	3.74 $\pm$ 2.4	0.214
Free T4 (pg / ml)	0.913 $\pm$ 0.65	0.85 $\pm$ 0.52	0.043*
TSH ( $\mu$ IU / ml)	8.499 $\pm$ 24.15	8.81 $\pm$ 24.74	0.879
Total	186	814	

**Table 2:** Distribution of different thyroid disorders according to ethnicity. **P value** was 0.11.

Ethnicity	Thyroid disorders					Total
	Euthyroidism	Hypothyroidism	Subclinical Hypothyroidism	Hyperthyroidism	Subclinical hyperthyroidism	
<b>Brahmin</b>	187 (66.31%)	21 (7.44%)	42 (14.89%)	25 (8.86%)	7 (2.48%)	282
<b>Chhetri</b>	204 (67.10%)	30 (9.86%)	32 (10.52%)	30 (9.86%)	8 (2.63%)	304
<b>Thakuri</b>	86 (74.78%)	3 (2.6%)	17 (14.78%)	5 (4.34%)	4 (3.47%)	115
<b>Tharu</b>	56 (58.33%)	4 (4.16%)	15 (15.62%)	16 (16.66%)	5 (5.20%)	96
<b>Rana</b>	11 (68.75%)	1 (6.25%)	2 (12.5%)	2 (12.5%)	0	16
<b>Newar</b>	6 (60%)	0	3 (30%)	0	1 (10%)	10
<b>Others</b>	108 (61.01%)	20 (11.29%)	27 (15.25%)	17 (9.6%)	5 (2.82%)	177
<b>Total</b>	658 (65.8%)	79 (7.9%)	138 (13.8%)	95 (9.5%)	30 (3.5%)	1000

**Table 3:** Distribution of different thyroid disorders according to the age group. P value was 0.01

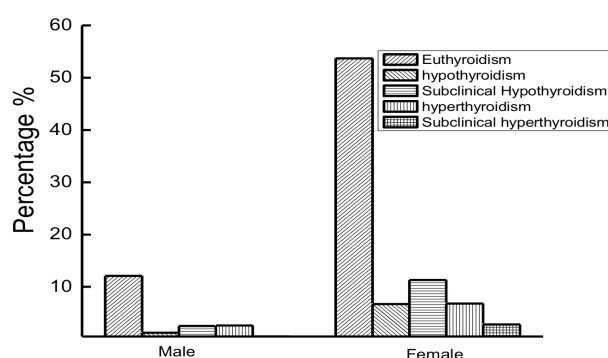
Thyroid status	Age Group				
	≤15	16-30	31-44	45-60	≥61
Euthyroidism	7 (43.75%)	254 (72.15%)	246 (62.91%)	118 (64.48%)	33 (56.89%)
Hypothyroidism	0	23 (6.53%)	33 (8.43%)	15 (8.19%)	8 (13.79%)
Subclinical Hypothyroidism	4(25%)	34 (9.65%)	56 (14.32%)	36 (19.67%)	8 (13.79%)
hyperthyroidism	5(31.25%)	31 (8.80%)	44 (11.25%)	9 (4.91%)	6 (10.34%)
Subclinical hyperthyroidism	0	10 (2.84%)	12 (3.06%)	5 (2.73%)	3 (5.17%)
<b>Total</b>	16	352	391	183	58

patients were classified by thyroid function based on FT<sub>3</sub>, FT<sub>4</sub> and TSH levels, and categorized into different groups like euthyroidism, hypothyroidism, sub-clinical hypothyroidism, hyperthyroidism and sub-clinical hyperthyroidism. The prevalence of each group were reported as percentages. Based on this 65.8%, 7.9%, 13.8%, 9.5% and 3.5% for euthyroidism, hypothyroidism, subclinical hypothyroidism, hyperthyroidism, and subclinical hyperthyroidism, respectively. The distribution of thyroid disorders in different ethnic group is shown in **Table 2**.

Our result shows among the ethnic groups, most of the thyroid disorders are noticed in Chhetri (hypothyroidism 37.97%, hyperthyroidism 31.37% and subclinical hyperthyroidism 26.66%). However, prevalence of subclinical hypothyroidism was noticed higher in Brahmin 40.57%. In addition, both Brahmin and Chhetri ethnic groups have higher prevalence rate than the other ethnic groups. The difference between these groups was not statistically significant. The lowest prevalences were observed among the Thakuri, Tharu, Rana, Newar and others.

Frequency of thyroid disorder was noticed highest in the age group of 31-44 years and lowest were shown in <15 years and >61 years. In addition,

hypothyroidism 41.77%, subclinical hypothyroidism 40.57%, hyperthyroidism 46.31%, and subclinical hyperthyroidism 40% were noticed. In addition, data revealed significant association with different age groups ( $P=0.01$ ). As compared to younger and older people, middle age adults (16-44 years) have slightly greater chances of being diagnosed of thyroid disorders. Similarly, all the thyroid disorder percentage is shown in **Figure 1**. Distribution of FT<sub>3</sub> was noticed statistically significant in different ethnic groups ( $P<0.05$ ). However, no significant difference was noticed in FT<sub>4</sub> and TSH among different ethnic groups (**Table 3-5**).

**Figure 1:** Prevalence of thyroid dysfunctions in Male and Female groups

**Table 4:** Distribution of T3 according to the ethnicity. P value was 0.05

Ethnicity	FT3			Total
	Low	Normal	High	
<b>Brahmin</b>	4 (1.41%)	254 (90.07%)	24 (8.51%)	282
<b>Chhetri</b>	12 (3.94%)	263 (86.51%)	29 (9.53%)	304
<b>Thakuri</b>	0	111 (96.52%)	4 (3.48%)	115
<b>Tharu</b>	1 (1.04%)	79 (82.29%)	16 (16.66%)	96
<b>Rana</b>	0	14 (87.5%)	2 (12.5%)	16
<b>Newar</b>	1 (10%)	9 (90%)	0	10
<b>Others</b>	8 (4.51%)	153 (86.44%)	16 (9.03%)	177
<b>Total</b>	26 (2.6%)	883 (88.3%)	91 (9.1%)	1000

**Table 5:** Distribution of T4 according to the ethnicity. P value was 0.14

Ethnicity	FT4			Total
	Low	Normal	High	
<b>Brahmin</b>	18 (6.38%)	245 (86.87%)	19 (6.73%)	282
<b>Chhetri</b>	28 (9.21%)	261 (85.85%)	15 (4.93%)	304
<b>Thakuri</b>	3 (2.6%)	107 (93.04%)	5 (4.34%)	115
<b>Tharu</b>	4 (4.16%)	82 (85.41%)	10 (10.41%)	96
<b>Rana</b>	0	14 (87.5%)	2 (12.5%)	16
<b>Newar</b>	0	10 (100%)	0	10
<b>Others</b>	16 (9.03%)	153 (86.44%)	8 (4.51%)	177
<b>Total</b>	69 (6.9%)	872 (87.2%)	59 (5.9%)	1000

## DISCUSSION

Thyroid disorder prevalence studies have allowed for worthy insights in discerning the epidemiology of thyroid disorders in population everywhere in the world. Nepal, a Himalayan country, lies in the severe ambient iodine deficiency zone and has a very high prevalence of iodine deficiency disorders (IDD).<sup>21</sup> There is a rise in the prevalence of all the thyroid disorders in Nepal. However, screening studies have been a rarity in Nepal and there is scanty literature on prevalence of these disorders in

all regions of Nepal. In our research most people evaluated the prevalence associated with thyroid disorders in various ethnic communities living in Kailali district of Far Western Region. This study is among the very first of its kind to examine ethnic variations in thyroid problems in the far western part of Nepal. The prevalence and the pattern of thyroid problems are determined by ethnic, geographical, and environmental factors, which including the iodine intake status.<sup>22</sup> The prevalence associated with thyroid disorders may differ around

**Table 6:** Distribution of TSH according to the ethnicity. P value was 0.5

Ethnicity	TSH			Total
	Low	Normal	High	
<b>Brahmin</b>	26 (9.21%)	198 (70.21%)	58 (20.56%)	282
<b>Chhetri</b>	24 (7.89%)	218 (71.71%)	62 (20.39%)	304
<b>Thakuri</b>	9 (7.82%)	86 (74.78%)	20 (17.39%)	115
<b>Tharu</b>	15 (15.62%)	62 (64.58%)	19 (19.79%)	96
<b>Rana</b>	3 (18.75%)	11 (68.57%)	2 (12.5%)	16
<b>Newar</b>	1 (10%)	7 (70%)	2 (20%)	10
<b>Others</b>	15 (8.47%)	117 (66.10%)	45 (25.42%)	177
<b>Total</b>	93 (9.3%)	699 (69.9%)	208 (20.8%)	1000

several parts of nations around the world<sup>11-13</sup> associated with diverse economic prosperity. However, it is unclear if these types of variations result from ethnic, environmental as well as economic reasons.

This study shows an overall 34.2% prevalence of thyroid disorders in the Far western population. 81.4% of the study subjects were women and 18.6% were male. In our study, the proportion of females having thyroid disorder is high. This is in accordance with the previous reports<sup>23-25</sup> that could be due to a sex difference in the prevalence of autoimmune disorders.<sup>26</sup> Despite all age groups suffering from thyroid dysfunction, a significant number of cases were observed in the age group of 31-44 years in our study. Similar results were reported by other studies.<sup>14-26</sup> This study illustrates subclinical hypothyroidism was found to be common type of thyroid disorder affecting 13.8% population, followed by hyperthyroidism (9.5%), hypothyroidism 7.9% and subclinical hyperthyroidism mainly, was alarmingly high in this region with female vulnerability. However, a study reported by Adhikari BR, et al.<sup>27</sup> in Bharatpur General Hospital revealed hypothyroidism (87.0%) followed by hyperthyroidism 11.2% and subclinical

hypothyroidism 1.9%. In addition, study by Aryal et al.<sup>3</sup> reported hypothyroidism 8%, subclinical hypothyroidism 8%, subclinical hyperthyroidism 6% and hyperthyroidism 3% respectively. The prevalence of hypothyroidism was more substantial in the age group of 31-44 years followed by aged group 16-30 years. On the other hand different studies noted that of subclinical thyroid condition was discovered to be higher in the age group of 40-60 years like that reported by Holowell et al.<sup>28</sup> This might be as a result of the reduced number of elderly aged people being referred to the test.

The mean FT4 level in our study show significant difference in male and female ( $P < 0.05$ ). However, FT3 and TSH data did not reveal any significant difference in both groups. However, similar findings were not supported in previous report by Yadav et. al.<sup>29</sup> with respect to gender. The prevalence of thyroid disorders is different among different ethnic groups but data did not showed any significant difference among these groups. Our study revealed that Chhetri, and Brahmin are most affected by thyroid disorders compared to Thakuri, Tharu, Rana and Newar groups. Among total thyroid disorders Chhetri had 30% hypothyroidism, 32% subclinical hypothyroidism, 30%

hyperthyroidism and 8% subclinical hyperthyroidism. However, Brahmins had 22.20% hypothyroidism, 44.21% subclinical hypothyroidism, 26.31% hyperthyroidism and 7.36% subclinical hyperthyroidism. Thus, each group might have a distinct social and genetic make-up that has been maintained by the physical limitations of hills and valleys, and the cultural and social limitations of common marriage within ethnicity.<sup>30</sup> In addition, these groups in our study, Brahmin, Chhetri, Thakuri, Tharu, Rana, and Newar, vary from one another significantly in several of facets of life for example ancestry, life experiences and roles within society.

Therefore, besides life style factors, ethnic, particular genetic components might also influence hormone levels. Population groups with variations identified by culture, religion or ethnicity also display variations with regards to disease, behaviour and beliefs and also vary genetically, to ensure that some disorders are more prevalent in certain ethnic groups. These various cultural contexts may equally put individuals at an increased risk of having a disorder and also influence the outcome.

The distribution of thyroid problems among the various ethnic communities was more prevalent in younger age groups compared to the older age. Both ethnic groups Chhetri and Brahmin had a

greater prevalence of thyroid disorder in comparison to other ethnic groups. It is therefore important to determine age-specific tendencies in thyroid disorder among young and middle age groups in this region. One of the limitations in this study is that our results are only generalizable to Brahmin, Chhetri, Thakuri, Tharu, Rana, and Newar in Nepal. In particular, people may not associate the signs and symptoms with the disease process and thus may not bring them to the attention of themselves against thyroid disorder. For this reasons, if early detection of these disorders would be possible then, it would not become any life threatening problem.

## CONCLUSION

In this study, we describe new evidence on variations in thyroid disorders indifferent ethnic groups in Far western Nepal. The observed differences suggest that ethnicity should be considered in screening and for the development of preventive strategies for thyroid disorders. The source of the ethnic variations in incidence remains uncertain, but doesn't appear to be clearly genetic: intergenerational social and cultural factors appear to modulate the biology of the disease. For more insight on the association of ethnic differences among thyroid disorders, more detailed study on large number of population is required.

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