

Research Article

Pattern of Thyroid Disorders in a Tertiary Care Centre, BPKIHS, Dharan

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Abstract

Introduction: Thyroid disorders are common endocrine abnormalities around the globe and Nepal is no exception. Regular evaluation of the burden of thyroid disorders in a tertiary care center like ours is of great relevance in respect to the health status of Nepal.

Objective: This study was carried out to find out the prevalence of thyroid disorder among the patients attending the immunoassay laboratory at Department of Biochemistry, B.P. Koirala Institute of Health Sciences, Dharan, Nepal. **Methodology:** This hospital based cross-sectional study, was conducted from January - December, 2015. Participants with complete thyroid function test were included in the study. Assessment of free Triiodothyronine (FT3), free Thyroxine (FT4) and Thyroid Stimulating Hormone (TSH) were done by Enzyme Linked Fluorescent Assay (ELFA) using automated Immunoanalyzer.

Statistical Analysis: Data were expressed in terms of figure, percentage, mean and standard deviation. Chi square and Kruskal Wallis test used to see the difference between groups. Binary logistic regression applied to see the association between dependent and independent variables. SPSS version 11.5 was used for the analysis. $P < 0.05$ was set for statistical significance.

Results: A total of 2104 participants were enrolled out of which 492 (23.3%) were male and 1612 (76.7%) were female. The prevalence of thyroid disorder in our study population was 39.3%. Majority of the subjects were female with 78.6% (648) and Male 21.4% (181) in population having Thyroid disorders. We found prevalence of 4.04% of overt hyperthyroidism, 16.49% of overt hypothyroidism, 2.9% of subclinical hyperthyroidism, 16.06% of subclinical hypothyroidism and 60.6% were euthyroid. Majority of the thyroid disorder subjects were of 20-60 years of age.

Conclusion: The prevalence of hypothyroidism was highest as compared to other thyroid disorders. The female were more prone to thyroid disorders as compare to male and difference was significant.

Keywords: Free T3; Free T4; TSH; Thyroid Disorders

Abbreviations

FT3: Free Tri-iodothyronone; FT4: Free Thyroxine; TSH: Thyroid Stimulating Hormone; ELFA: Enzyme Linked Fluorescent Assay; β -HCG: Human Chorionic Gonadotropin; LH: Lutenizing Hormone; FSH: Follicle Stimulating Hormone

Introduction

Thyroid disorder is defined as the abnormal Thyroid Stimulating Hormone (TSH) with normal or abnormal thyroid hormones, Free Tri-iodothyronine (FT3) and Free-Tetraiodothyronine (FT4). It is the most common endocrine disorder affecting more than 300 million people worldwide and almost half of them are presumed to be unaware of their condition [1]. Thyroid dysfunction is also a major health problem in eastern Nepal with prevalence of nearly 30% in a study conducted in 2002. The pattern and prevalence of thyroid disorders depends on ethnicity, geographic and environmental factors including iodine intake status [2,3]. Nepal lies in mountainous land locked area which is situated far away from the sea; an area of

endemic iodine deficiency. This factor leads to a very high incidence of iodine deficiency disorders. Iodine deficiency is prevalent in the Himalayan, sub-Himalayan and the Terai regions of Nepal [4]. Indeed, iodine deficiency is regarded as the most common cause of thyroid disorders worldwide [5-7].

Other causes of thyroid disorders may be due to congenital factors, a genetic predisposition, pregnancy, radiotherapy, viral infections, surgery, underlying diseases such as infiltrative disorders, or even autoimmunity [8,9]. One of the study in 2013 showed the prevalence of hypothyroidism higher than hyperthyroidism in western Nepal population with more common in older women [10].

Few studies revealed that incidence of thyroid disorder increase with advancing age. Studies in developed countries have shown, hypothyroidism tends to increase with age and is more common in women [11,12]. Although all age group presented with thyroid dysfunction, a higher number of subjects were observed in the age groups of 31-45 years [13]. Few studies have revealed that incidence of hypothyroidism increases with advancing age [14]. Thyroid

Table 1: Thyroid hormone status based on gender in different thyroid disorder.

Thyroid States	Age	fT3	fT4	TSH	P value*
Group 1	34.35±15.8	12.49±7.06	38.71±20.94	0.05±0.03	<0.001
Total (85)	33.26±16.41	10.75±4.02	35.53±18.22	0.05±0.01	
Male (23)	34.76±15.7	13.13±7.83	39.89±21.88	0.06±0.03	
Group 2	39.04±16.37	2.97±3.06	2.34±2.46	18.55±17.03	<0.001
Total (345)	39.72±2.12	3.49±5.8	2.14±2.16	18.55±17.03	
Male (84)	38.82±15.01	2.8±1.21	2.4±2.55	17.87±16.43	
Group 3	37.93±13.79	6.24±1.24	15.88±2.87	0.10±0.06	<0.001
Total (61)	39.9±18.4	6.68±1.95	17.12±2.66	0.09±0.07	
Male(10)	37.55±12.89	6.15±1.06	15.63±2.87	0.1±0.06	
Group 4	38.36±15.19	5.52±0.73	12.98±2.43	9.44±6.29	<0.001
Total (338)	40.68±21.53	5.74±0.93	13.63±2.52	8.97±6.19	
Male (64)	37.82±13.27	5.47±0.67	12.82±2.39	9.55±6.32	
Group 5	36.57±15.48	5.81±0.72	14.35±2.32	2.32±1.21	<0.001
Total (1275)	36.35±18.6	6.04±0.84	14.83±2.37	2.22±1.17	
Male (311)	36.64±14.35	5.73±0.65	14.2±2.28	2.35±1.22	

*fT3, fT4 and TSH level of Group 1,2,3 and 4 showed statistically significant differences when compared with Group 5 (Euthyroid). Kruskal- Wallis test applied, P<0.05 considered statistically significant.

dysfunction is associated with several other clinical conditions like goiter, dyslipidemia, dysmenorrhea, infertility, abortion, dermatological, mental retardation and several psychiatric symptoms. Public awareness, education and change in socio-economic status has encouraged people to use iodized salt and seen substantial progress in elimination of iodine deficiency in eastern Nepal [15]. There is no recent data regarding the prevalence of thyroid dysfunction after study done by Baral et al in 2002 from this region. So this study is designed to access the prevalence of thyroid disorder in population attending the tertiary health care of eastern Nepal.

Materials and Methods

Study design

This was a hospital based cross-sectional study, conducted in the Department of Biochemistry of a Tertiary Health Care Centre and Teaching Hospital. A total of 2104 subjects, who attended the immunoassay laboratory for the first time for thyroid screening were enrolled in the study after taking their consent. The patients with incomplete thyroid function test and reports from hemolyzed samples were not taken under consideration in this study. Also the subjects with multiple endocrine disorders were excluded from our study.

Study population

The patients from 10 district of Mechi and Koshi Zone who seek health care service to the tertiary care centre were included in the study. As this region is endemic iodine deficient zone so we targeted these populations.

Sample collection

The blood sample was collected through Vacutainer tube. Samples were centrifuged immediately after clotting and the serum was stored at -20 °C until assayed.

Assay of the thyroid panel

Assessment of fT₃, fT₄ and TSH was done by Enzyme Linked Fluorescent Assay (ELFA) using automated Immunoanalyzer (VIDAS-BioMérieux Clinical Diagnostics). All the three parameters

Table 2: Association of thyroid disorders between Genders.

Thyroid disorders	Male	Female	Total	P value*
Overt Hyperthyroidism	23	62	85	.580
Overt Hypothyroidism	84	261	345	.986
Subclinical Hyperthyroidism	10	51	61	.153
Subclinical Hypothyroidism	64	274	338	.035
Euthyroid	311	964	1275	

*Pearson's chi square test used to determine association of gender between thyroid disorders (Group 1, 2, 3, 4) and Euthyroid (Group 5) subjects. P<0.05 was considered statistically significant.

were estimated following the standard protocol as manufacturer's guideline. The reference interval for fT₃, fT₄ and TSH were 4.0-8.3pmol/L, 9.0-20.0pmol/L and 0.25-5.0mIU/ml respectively. After the assay, data were recorded from the register maintained in the Lab.

Diagnosis and definitions

The diagnosis of thyroid disorders was based exclusively on hormonal assay of the participants. Suspected cases of thyroid disorder after clinical examination were send from Medicine Out Patient Department (OPD) and based on their provisional diagnosis and lab report we categorized the participants follows. No any further immunoassay of antibodies was performed. Overt Hyperthyroidism was defined as TSH of < 0.25 mIU/ml plus high fT₄ (> 20.0 pmol/L) and high fT₃ (> 8.3pmol/L) and denoted as Group 1. Overt Hypothyroidism was defined as increased TSH (>5.0 mIU/ml) plus low fT₄ (<9.0 pmol/L) and fT₃ (< 4.0 pmol/L) and denoted as Group 2. Subclinical hyperthyroidism was defined as TSH <0.025 mIU/ml and normal fT₄ (9.0-20.0 pmol/L) and fT₃ (4.0-8.3 pmol/L) and denoted as Group 3. Subclinical hypothyroidism was defined as increased TSH (>5.0 mIU/ml) plus normal fT₄ (9.0-20.0 pmol/L) and fT₃ (4.0-8.3 pmol/L) and denoted as Group 4. Euthyroidism was defined as TSH of 0.25-5.0 mIU/ml, fT₄ of 9.0-20.0 pmol/L and fT₃ of 4.0-8.3 pmol/L and denoted as Group 5.

Data management and statistical analysis

Data were collected and entered in Microsoft Excel™. Adjustment

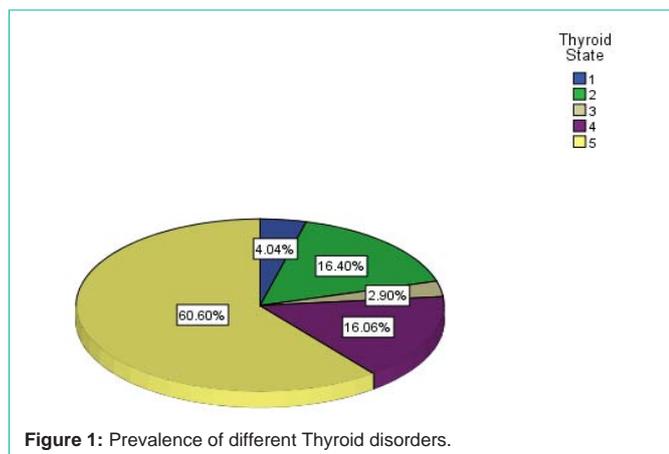


Figure 1: Prevalence of different Thyroid disorders.

to normal distribution was tested by Kolmogorov test. For quantitative variables, results are expressed as mean±SD for normally distributed data and as median (interquartile range) for non-parametric data. Categorical variables are described as percentage (%) or ratios. Logistic Regression model was prepared to obtain odd ratios and confidence interval. Data were analyzed using Statistical Package of Social Science (SPSS), version 11.5. Differences were considered significant when P<0.05.

Results

In this hospital based cross sectional study, a total of 2104 subjects who attended the immunoassay laboratory of Biochemistry department for the first time for thyroid status assessment were enrolled in the study. The majority of the participants in the study were female (76.7%) and male only 23.3%. The total subjects were categorized into overt hyperthyroidism, overt hypothyroidism, subclinical hyperthyroidism, subclinical hypothyroidism and euthyroid based on the thyroid status as per their normal reference range.

The mean values of fT3, fT4 and TSH among the different thyroid disorder were calculated and statistically significant difference was found between different thyroid disorders (Table 1). Among the total 2104 subjects, 39.3% (n=829) had some kind of thyroid disorders and 61.7% were euthyroid (n=1275). Majority of the subjects in thyroid disorder were female with 78.6% (648) and Male only 21.4% (181) in total. Overt hypothyroidism cases were most abundant with 16.49% (n= 345) of the total thyroid disorder patients followed by subclinical hypothyroidism (n=338, 16.06%), overt hyperthyroidism (n=85, 4.04%) and subclinical hyperthyroidism (n=61, 2.9%) respectively. Female is to male ratio in total hypothyroid cases was approximately 3.6:1 (Table 1). Figure 1 shows the percentage distribution of the various thyroid states. Chi square test was performed to see association of gender with different thyroid disorders and euthyroid subjects as shown in Table 2. We found statistically significant difference in sub clinical hypothyroids and euthyroids in relation to gender.

Binary Logistic regression model was prepared to see the association of age and sex with the presence or absence of thyroid disorder (Table 3). We found that age is significantly associated with the outcome of thyroid disorder as predicted in the model, whereas gender does not have significant association in predicting the

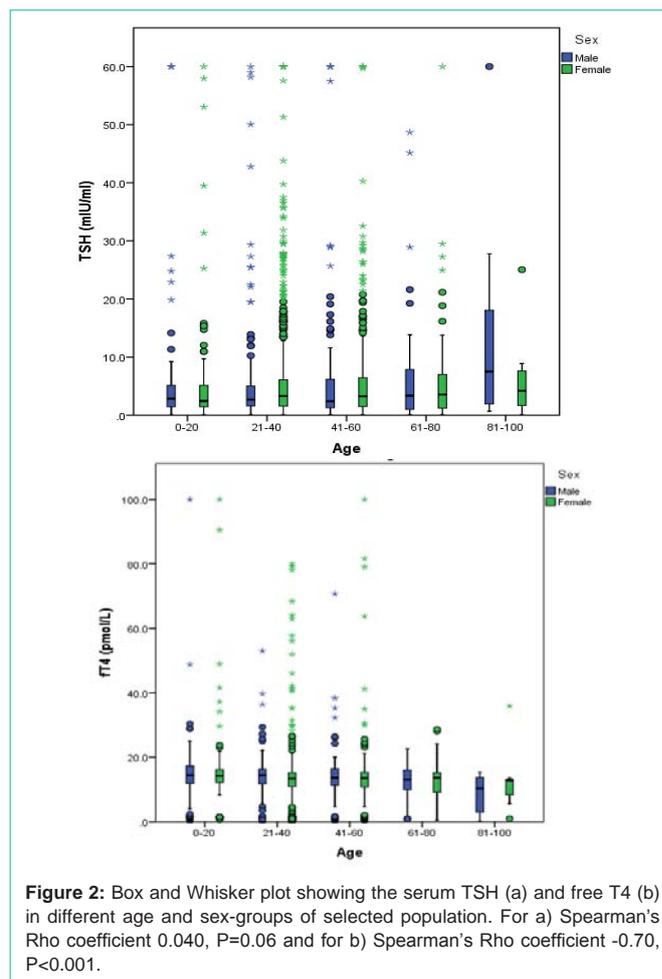


Figure 2: Box and Whisker plot showing the serum TSH (a) and free T4 (b) in different age and sex-groups of selected population. For a) Spearman's Rho coefficient 0.040, P=0.06 and for b) Spearman's Rho coefficient -0.70, P<0.001.

Table 3: Logistic Regression model for predicting thyroid disorder from the independent variables.

Independent Variables	Odd Ratios	95% Confidence interval		P value
		Lower	Upper	
Age	1.007	1.002	1.012	0.018
Sex (1)	.863	.700	1.064	0.167

outcome of disease.

We plotted a Whisker- Box plot of TSH and fT4 value against various age group in the whole study population and found that TSH is in higher range in the elderly population of age group 81-100, though we had only 17 participants in these age group. Similarly fT4 was in lower range in the same age group (Figure 2a and 2b.).

Discussion

Nepal is one of the South Asian country which lies in an iodine deficiency belt where goiter is endemic. A survey done by Baral et al. in Eastern Nepal showed that urinary iodine showed that 12.9% of the population was deficient in iodine, compared with a countrywide prevalence of 18% [16]. Thyroid disease is a very common endocrine disorder, and female are more prone [17]. The prevalence of hypothyroidism, both subclinical and overt, among adult females from all age groups ranges from 3.0 to 7.5% and is seen more

frequently seen in elderly women [12]. Studies in developed countries have shown, hypothyroidism tends to increase with age and is more common in women and people with goiter [12,14].

Our result shows that majority of the hypothyroid cases were female and in the age range of 40-60 years. Recent further analysis suggested that the incidence of thyrotoxicosis was increasing in women but not in men between 1997 and 2001 [18]. Among the thyroid dysfunction cases, 21.4% were male and 78.6% were female, showing that female is more vulnerable to the disease. This trend may be due to the increase preponderance of autoimmune disorders in female as compare to male. Also the fluctuating reproductive hormones in female might have some synergistic action on thyro-pituitary axis. For instance the structural similarities between β -HCG, Luteinizing Hormone (LH), Follicle Stimulating Hormone (FSH) and TSH, action of TSH is mimicked by the reproductive hormone and results in additive response. This additive action on TSH may cause suppression in thyroid hormones that may cause hypothyroid disorders in female. The annual incidence of hypothyroidism in females has been estimated as 3-5/1000, while every year 0-8/1000 females will develop hyperthyroidism [19]. This result was similar to the finding of the study by Aryal et al. and Mark et al. [20,21]. But the result in a study by Baral et al. showed the contrasting result where they found similar male: female ratio for thyroid dysfunction [2].

In this study we found that majority of the thyroid disorder was hypothyroidism (Overt and subclinical) and this was in accordance with the recent findings of different researchers [2,13,22]. They also found that hypothyroidism was most prevalent thyroid disorder. Whereas Aryal et al. found that both subclinical as well as overt hypothyroidism were equally prevalent [20]. However several studies [23-25] defer from our findings, where they found hyperthyroidism was more prevalent than hypothyroidism. This difference may due to the socio-environmental factor like geographical discrepancies and their dietary habit etc.

Conclusion

To conclude, the prevalence of thyroid disorder in a sample of semi urban population of eastern Nepal is found to be 39.3%, which has increased in quite alarming rate when compared to previous studies on similar population. The females were more vulnerable to the disease as compare to male. Nevertheless community health education is needed to impart the correct information regarding the prevention and control of this non communicable epidemic disease. Also to generalize this findings large scale survey involving the whole eastern region through random sampling is needed.

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