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Research Article

Prevalence of Thyroid Disorders in Clinically Suspicious Patients

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Abstract

Introduction: Thyroid diseases are a widespread health problem in Nepal, as it is in the rest of the world. There is, however, a scarcity of information on the prevalence of thyroid disorders in Nepalese people. The objective of the study is to find the prevalence of thyroid dysfunction in clinically suspicious patients visiting hospital of Madan Bhandari Academy of Health Sciences

Methods: At a provincial hospital in Central Nepal, a retrospective, hospital-based, observational study was done. Thyroid profile data, including Triiodothyronine (T3), Thyroxin (T4), and Thyroid stimulating hormone (TSH) levels, were obtained between July 2017 and December 2019 from the Laboratory of Madan Bhandari Academy of Health Sciences - Hetauda Hospital, Department of Lab Medicine. The data were retrieved then descriptive analysis was done using SPSS 16.

Results: Our study involved 4182 patients, 743 of whom were male and 3449 of them were female. Thyroid function tests were most typically investigated in females between the ages of 18 and 35. Subjects having thyroid dysfunction in our study population was 16.66%. Females (16.75%) had a higher rate of thyroid dysfunction than males (16.01%%). The most frequent thyroid disease (14.10%) was subclinical hypothyroidism. A positive association was observed between age and TSH levels (r = 0.02) which was not significant (p = 0.06).

Conclusion: The most common thyroid disease among the research participants was subclinical hypothyroidism. Females between the ages of 18 and 35 are more susceptible to thyroid disorders.

Keywords: Hyperthyroidism; Hypothyroidism; Prevalence; Thyroid Disorder

Introduction

Globally, disorders of the thyroid are prevalent and Nepal is no exception to it [1,2]. Growth and development of the human body are influenced by thyroid hormones. Alterations of thyroid hormones affect most of the organs of the human body. Symptoms and signs can vary widely and can result in significant morbidity and mortality. Lack of understanding of thyroid disorders has led to a significant number of people being unaware of the condition. Prognosis is better when diagnosed early and treated properly. The effects of thyroid hormone deficiency extend beyond biological impacts to include social and professional factors as well. Women, ages, ethnicities, geographies, and iodine intake all contribute to thyroid dysfunction [3]. Thus, prevalence of thyroid disorders can't be predicted based on statistics from one population. In order to provide researchers, guideline developers, and policymakers with baseline data about thyroid disorder, this hospital-based prevalence study was conducted. These data can be used for identifying priorities in healthcare, prevention, and policy-making.

Materials and Methods

The study was undertaken by utilizing data retrieved from Madan Bhandari Academy of Health Sciences - Hetauda Hospital's Department of Laboratory Medicine between July 2017 and December 2019. All patients (n = 4182) with clinical suspicion of thyroid disorder who attended the outpatient department (OPD) or inpatient department (IPD) of a hospital were included. The study was ethically cleared by the Ethical Review Board of Nepal Health Research Council. The secondary data from MIDAS software was retrieved and then analyzed. Thyroid function tests (Total T4, Total T3, Free T3, Free T4, and TSH) were performed using immunoassay analyzers on serum of individuals with suspected thyroid dysfunction. At the laboratory, three milliliter (ml) of blood samples were collected in an aseptic condition in the morning. Once the sample clotted, it was centrifuged at 2000 rpm/min for 30 minutes to separate the serum. After labeling the serum and storing it at -20^{o}C, assays were performed later.

The TSH levels of serum samples were analyzed using a 3rd generation automated electrochemiluminescence sandwich immunoassay (Lifetronic, CL- 8000). The analytical sensitivity was 0.004 µIU/ml. The laboratory's reference values were TSH: 0.55-4.78 µIU/ml; fT3: 2.3-4.2 pg/ml; fT4: 0.89-1.76 ng/dl; T3: 60-181 ng/dl and T4: 4.5-12.60 µg/dl. Analytical sensitivity was 0.004 µIU/ml for TSH, 0.4 µg/dl for T4, 35 ng/dl for T3, 0.05 ng/dl for FT4 and 1.0 pg/ml for FT3. Hypothyroidism was classified as clinical (overt) if TSH was ≥ 4.78 µIU/ml and FT4 ≤ 0.89 ng/dL or T4 ≤ 4.5 µg/dl and subclinical if TSH was ≥ 4.78 µIU/ml and FT4/T4 was within the reference range. Hyperthyroidism was classified as clinical (overt) if TSH was ≤ 0.55 µIU/ml and FT4 ≥ 1.76 ng/dL or T4 ≥ 12.6 µg/dl and subclinical if TSH was ≤ 0.55 µIU/ml and FT4 and T4 was within the reference range.

The data were analyzed using Statistical Package for Social Science (SPSS) version 16.0 (SPCC Inc. Chicago). The data was analyzed using descriptive statistics. The data were presented as frequency, percentage, and mean ± SD.

Results

There were a total of 4182 (male = 743, female = 3449) patients enrolled in our study. Study participants had a mean age of 42.59 ± 15.19 years ranging from one year to 102 years old. Participants' ages ranged from three years to 102 years for males, and 1 year to 92 years for females. Male participants' mean age was 47.35 ± 17.39 years whereas mean age of female participants was 41.58 ± 14.48 years.

Those who took part in the study tended to be mostly females in the 18-35 age bracket. Males, however, tended to belong to the older age groups, most of whom were over 55 (Figure 1).

Figure 1: Age Group wise distribution of the study population.

The total number of euthyroid participants in our study was 3444. Subclinical hypothyroidism was most prevalent among the participants (Table 1).

Thyroid status	Male	Female	Total	Prevalence (%)
Clinical Hypothyroidism	13	66	79	1.88
Sub-clinical Hypothyroidism	103	487	590	14.10
Hyperthyroidism	3	25	28	0.6
Total	119	578	697	16.67

Table 1: Distribution of thyroid disorders (n = 697).

Out of total, 41 participants had thyroid function test finding not falling into any of the defined categories. Some of them had hyperthyroidism (n = 9) of secondary or tertiary.

Men with hypothyroidism had the oldest mean age, while women with hyperthyroidism had the oldest mean age (Table 2).

Thyroid status	Male		Female	
	Mean (yrs)	Range (yrs)	Mean (yrs)	Range (yrs)
Hyperthyroidism	52.67 ± 10.97	44-65 years	45.60 ± 16.77	24-70
Hypothyroidism	58.15 ± 14.62	36-83	44.82 ± 15.14	20-73
Subclinical Hypothyroidism	50.94 ± 16.02	10-102	44.39 ± 13.94	13-82
Euthyroidism	46.54 ± 17.61	3-97	40.97 ± 14.45	1-89

Table 2: Age of patients with different thyroid disorder.

Majority of those with hyperthyroidism were females, ranging in age from 18 to 35 years. Among study participants with clinical hypothyroidism, the majority were females aged 18-35. Subclinical hypothyroidism was most common in females 18-35 years of age, and in males over 55 years of age (Table 3).

Age group (yrs)	Hyperthyroidism		Hypothyroidism		Sub-clinical Hypothyroidism	
Age group (yrs)	Male	Female	Male	Female	Male	Female
<18	0	0	0	0	1	3
18-35	0	12	0	22	19	142
36-45	1	2	3	15	18	115
46-55	1	2	2	9	23	123
>55	1	9	8	20	42	104

Table 3: Distribution of thyroid disorder of different age groups among males and females.

The TSH values did not significantly (p = 0.06) correlate with age (r = 0.02).

Discussions

We found 16.67% subjects having thyroid dysfunction in our study population. Participating in this study are primarily residents of Makwanpur and Bara districts of Nepal. There is a variable prevalence of thyroid disorders associated with age, sex, geography, and intake of iodine. Thyroid disorders were found to be highly prevalent in similar studies conducted across Nepal in varied contexts [1-3]. Nepal is a mountainous landlocked country. Natural iodine is deficient in the Himalayan soils and rivers. Years of washing of the soil by glaciers and strong rains have resulted in a loss of iodine content. Iodine shortage can continue in the soil indefinitely because there is no natural method to remedy it. In such a climate, all crops would be lacking in iodine. As a result, humans and animals who are completely reliant on such crops are at risk of iodine deficiency. In the Himalayas, outright cretinism used to be frighteningly widespread [4]. During an assessment of micronutrient status conducted in 2016, it was found that Nepal's Universal Salt Iodization program has resulted in an optimal intake of iodine. In 1998, Nepal adopted the Iodized Salt (Production,

Sale, and Distribution) Act, requiring all salt to be iodized before it could be sold or distributed [5].

All of this has resulted in a lower incidence of cognitive impairment in today's babies, allowing youngsters to thrive, a remarkable achievement for a country where cretins historically accounted for 18% of 750 residents of a place in the mountainous region of Nepal [4]. Current hospital based study puts high prevalence of thyroid disorder. The finding is however not comparable to earlier studies where the reported prevalence were 22.4- 25% [1-3]. The most likely explanation is that, as a result of health insurance coverage, more healthy people are getting general health examinations. In addition, the majority of people may have been on medication due to coverage by the health insurance scheme. Also, as previous studies were conducted at least around five years back, the health infrastructure improvement in the last few years might have contributed to the decrease in prevalence of thyroid disorder [6].

There was notable female preponderance in the current study. Likewise the prevalence of thyroid disorder was slightly higher in females (16.75%) compared to males (16.01%). Similar findings were observed in earlier studies [1,7]. Women are more likely than men to suffer from thyroid disorders. Many thyroid disorders are autoimmune in nature, explaining this gender difference in part. The immune system is more readily influenced by sex steroids in women, resulting in autoimmune disease. Even though their effects on lymphocyte differentiation and maturation are incompletely understood, estrogen and progesterone are thought to be involved in triggering an immune response [8].

Females belonging to the age group 18-35 were most commonly affected with thyroid disorder. The prevalence of thyroid problems among women in this age group draws attention to the expanding health requirements of this significant segment of Nepalese society, especially given the link between thyroid disorders and cardiovascular risk factors such as hypertension and dyslipidemia.

As in earlier studies at Nepal [1], and India [7], the majority of females seeking thyroid function testing were similar. However, the majority of male seeking thyroid function tests belonging to the age group above 55 were not in line with earlier studies [1,7].

The most common abnormality in our study was elevated TSH with the majority of the participants having subclinical hypothyroidism. A study conducted in far western Nepal reported Hyperthyroidism to be the most common thyroid dysfunction [9]. In a study conducted among children between 6 and 12 years old at Udayapur district, Eastern Nepal, subclinical hypothyroidism was also most commonly encountered in children with excess thyroid consumption. Uncertainty surrounds the exact mechanism through which chronic high iodine intake leads to hypothyroidism. Iodine intake that exceeds the recommended daily intake damages thyroid peroxidase and induces apoptosis in cell tissues in a manner that involves free radicals. However, it isn't known whether iodine-induced apoptosis leads to chronic iodine-induced hypothyroidism [10].

There are several limitations to our research: Because it was a single hospital-based study, the prevalence of thyroid diseases may have been exaggerated. Second, the study assumed that the target group was iodine sufficient based on their consumption of iodized salt, rather than checking for reliable markers such as iodine concentration in salt samples or urine iodine excretion. As a result, etiological factors were not researched. In addition, the study's nonrandomized design and lack of clinical data are significant limitations, and some individuals with low or normal TSH may be on levothyroxine. Due to the retrospective nature of the study, the co-morbidities of the study participants could not be analyzed. The finding that a large proportion of people have thyroid dysfunction without realizing it supports the value of regular thyroid function screening for early detection and treatment of thyroid dysfunction. The current study may not represent the entire population because it was conducted in a single center hospital. The study did, however, identify the prevalence of thyroid dysfunction in Hetauda Hospital, which can be used as a baseline data for further study.

To provide precise data about thyroid dysfunction in the community, we recommend a large countrywide epidemiological study with rigorous methodology and extensive field-based in nature.

Conclusion

Our study suggested that the prevalence of thyroid disorders among the population seeking thyroid screening in MBAHS hospital, Hetauda is high (16.67%) and subclinical hypothyroidism (14.10%) is most common. We conclude that women of the age group 18- 35 are highly prone to developing a thyroid disorder.

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Ethics Approval and Consent to Participate

We have obtained the necessary ethical committee approval 844/2020P from the Ethical review Board, Nepal Health Research Council for the study and it is included in the manuscript.

Consent for Publication

We declare that appropriate consent is obtained from patients/ next of kin.

Availability of Data and Materials

The datasets generated during our study are available from the corresponding author upon request from the journal.

Competing Interests

We don't have any conflict of interest with any organization with regards to research work discussed in the manuscript.

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None.

Authors' Contributions

We state that all the authors listed in on the title page have contributed significantly to the work, have read the final manuscript to validate and confirm the content, data and interpretation, responsible for what is mentioned in it, and agree to its submission to the journal.

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