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Research Article

STATUS OF THYROID DISORDERS IN CENTRAL NEPAL: A TERTIARY CARE HOSPITAL BASED STUDY

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Abstract

Background: Nepal is a Himalayan, landlocked country surrounded by India and China. It is endemic for iodine deficiency disease. Thyroid dysfunction is major health problem among the Nepalese people. Its prevalence increases with age. Screening of thyroid disease is advised in high risk population**. Objectives:** To find out the prevalence of thyroid dysfunction among subjects who attended Biochemistry Department of Tribhuwan University Teaching Hospital, Kathmandu, Nepal. **Material and Methods:** This is a hospital based retrospective study conducted in the Department of Biochemistry Tribhuwan University Teaching Hospital, Institute of Medicine. This study was designed to investigate status of thyroid dysfunction in central Nepal. A total of 5230 cases from all over Nepal were studied in a single year. Blood samples were collected, serum separated and thyroid hormones (fT_3, fT_4 and TSH) were assayed by Vitros ECIQ analyser Ortho Clinical Diagonostics USA. **Result and discussion:** Among 5230 subjects prevalence of thyroid dysfunction was 29.0% with subclinical hypothyroidism17%, hypothyroidism 8%, hyperthyroidism 3%, subclinical hyperthyroidism1% and euthyroidism 71%.Higher prevalence was seen in the age group 31-45. **Conclusion:** This study revealed that subclinical and overt hypothyroidism is preponderant followed by sub clinical hyperthyroidism. Females are more vulnerable to the thyroid dysfunction. Since it is a hospital based study, the prevalence of thyroid dysfunction may not be applicable. So an extensive demographic survey should be done to provide accurate data of thyroid dysfunction in the general population.

Keywords: Thyroid Disorders; iodine deficiency; hypothyroidism

Introduction

Alteration of Thyroid Stimulating Hormone (TSH) with normal or abnormal freeT3 and free T4 hormone indicates thyroid dysfunction (Peter, 2009) Thyroid disorder along with goiter is one of the major health problems in the eastern part of Nepal (Ashworth *et al.*, 1996). It has been estimated that 0.2% of the deaths in Nepal results from endocrine disorder. Among which iodine deficiency has been major cause (World Health Organization., 2001).Different factors associated with thyroid dysfunction, congenital factors, and genetic predisposition, inadequate iodine intake, pregnancy, viral infections, radiotherapy, surgery, autoimmunity (Vanderpump *et al.*, 2002; Wiersinga *et al.*, 1995; Brownlie *et al.*, 1990). The prevalence of hyperthyroid (13.68%), hypothyroidism (17.19%) in eastern Nepal (Helfand *et al.*, 998) and 17.42% in western Nepal(Risal *et al.*, 2010).The prevalence of thyroid dysfunction, by definition is the testing of the patients in various geographical regions, primary care clinics and in population that have not been screened previously(Parle *et al.*, 1992; Friedman *et al.*, 1999).American thyroid association recommended that adults be screened for thyroid dysfunction by measuring serum thyrotropin concentration beginning at the age of 35 and every 5 years thereafter(Ladenson *et al.*, 2000).Nepal is one of the high risk populations with its high prevalence of iodine deficiency disorder(. Gelal *et al.*, 2009).Though the prevalence of thyroid dysfunction has been studied in eastern and western part of Nepal. This is the first study to assess the prevalence of thyroid dysfunction in the central region of Nepal. The study was designed to study different thyroid disorders prevalent in patients visiting department of Biochemistry, Tribhuwan University Teaching Hospital (TUTH) Kathmandu, Nepal.

Materials and Methods

This retrospective study was conducted in Department of Biochemistry, Tribhuvan University Teaching Hospital Kathmandu Nepal from January 2010 to December 2010.Total 5230 patients visiting Biochemistry Laboratory for thyroid function tests were included in this study. Duplication of persons involved in follow up was excluded;

ethical clearance was taken as per the guidelines of the research Unit of Institute of Medicine.

Collection of Blood Samples

Venous blood sample (2-3 ml) was collected from ante-cubital vein in a plain vial, and was allowed to clot, then subsequently serum was separated by centrifugation at 3000 g for 10 minutes and stored at -20 °C until thyroid hormones were estimated.

Assay procedure of thyroid hormones

The thyroid hormones (fT_3, fT_4 and TSH) were assayed by Vitros ECIQ analyser Ortho Clinical Diagonostics. The reference range used for fT_3 was 1.21-4.18 pg/mL, for fT_4 were 7.2-17.2 pg/ mL and for TSH was 0.6-4.5 µIU/mL.Thyroid function was considered normal (Euthyroidism) when subjects had all the three hormones within the reference range. Abnormal thyroid function was further categorized as hyperthyroidism (increased FT_3, $FT_4$and low TSH below the normal level), subclinical hyperthyroid (both FT_3 and FT_4 are normal but TSH lower), hypothyroidism (decreased FT_3, FT_4 and increased TSH) and subclinical hypothyroidism (FT_3, FT_4 are normal but elevated TSH level) (Peter, 2009; Helfand and Redfern, 1998).

Statistical Analysis

The data entered in MS Excel 2007 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 and Mean ±SD. Normality test was done using Komolovsmrinov test. Student's' test was applied for parametric data. Chi Square test was applied for the comparison of non-parametric qualitative variables. P value <0.05 was considered statistically significant.

Results

In this study total 5230 subjects were enrolled from January 2010 to December 2010.Among these subjects 32.10% were male and 67.90 %were females. Majority of the subjects who visited TUTH for thyroid hormone investigation were female. In this study subjects are divided according to the thyroid status which shows subclinical hypothyroidism 885(17%) hypothyroidism 396(8%), hyperthyroidism134 (3%), subclinical hyperthyroidism 75(1%) and euthyroidism 3740 (71%) as shown in Fig 1 pie chart.

Overall prevalence of thyroid disorder was found to be 29.0 with subclinical hypothyroidism being the most common 17.0%.Table 1. Shows most of the patients were in the age group 31-45(N=522) followed by 16-30 years age group (N=398),46-60(N=301).More Subclinical hypothyroidism (23.1%) 71 and hypothyroidism(14.7%) 45 cases were seen in less than 15 year of age group and the decreasing trends of prevalence was seen with increasing age. Prevalence of pituitary defect was similar in ≤15 and ≥61 age groups (0.2% and 0.3%).Table 2 shows the comparison of thyroid hormone level among various thyroid dysfunctions. The ANOVA test was applied to check the significant difference of variables between each group.fT3, ft4 and TSH shows significant difference among different thyroid disorder.

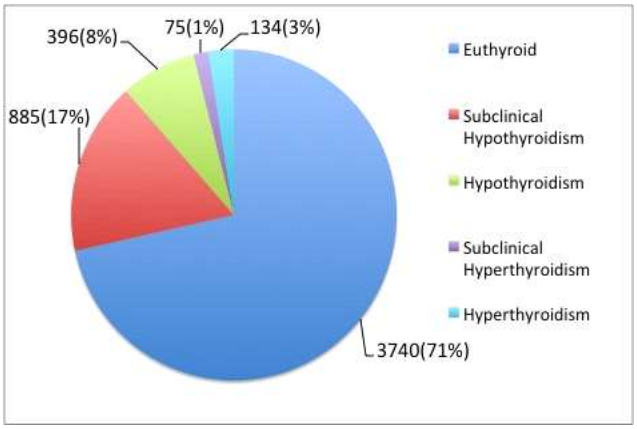

Fig 1: Distribution of different thyroid disorders

Table 3 shows the comparison of thyroid hormones between male and female. Males (2.43±1.44) have significantly lower level of ft3 and ft4 hormones than females (2.6±1.77) in our study. (p value <0.05).But there is no significant difference in the TSH level between male and female.

Table 1: Distribution of different thyroid disorders according to age groups

Thyroid status	Age Groups					P value
	≤15	16-30	31-45	46-60	≥61	
Normal	183((59.6%)	1062(72.7%)	1319(71.6%)	768 (71.8%)	395(71.6%)	
Subclinical Hypothyroidism	71 (23.1%)	254(17.4%)	318 (17.3%)	162(15.2%)	80 (14.5%)	
Hypothyroidism	45 (14.7%)	82 (5.6%)	126(6.8%)	92 (8.6%)	50 (9.1%)	
Subclinical Hyperthyroidism	3 (1.0%)	17 (1.2%)	27 (1.5%)	17 (1.6%)	11 (2.0%)	0.001
Hyperthyroidism	4 (1.3%)	40(2.7%)	48 (2.6%)	27 (2.5%)	15 (2.7%)	
Pituitary defect	1 (0.3%)	5 (0.3%)	3 (0.2%)	3 (0.3%)	1(0.2%)	
Total	307	1460	1841	1069	552	

Table 2: Represents comparison of thyroid hormone levels among various thyroid dysfunction levels.

Thyroid Hormones	(Mean ± E) Euthyroidism	(Mean ± SE) Hypothyroidism	(Mean ± SE) Subclinical Hypothyroidism	(Mean ± SE) Hyperthyroidism	(Mean ± SE) Subclinical Hyperthyroidism	Mean ± SE Pituitary defect	P value
fT3 (pg/ml)	2.3±0.6	1.1±0.7	1.8±0.5	7.4±5.6	2.9±0.8	5.9±1.7	0.001
fT_4(pg/ml)	11.5±2.	4.6±2.7	9.4±1.5	25.6±13.3	13.3±3.2	20.2±3.3	
TSH(µIU/ml)	2.3±1.1	31.9±24.2	7.4±6.7	0.3±0.2	0.4±0.1	9.5±8.3	

Table3: Comparison of thyroid hormones in different gender

Thyroid Hormones	**Male Mean±SD**	**Female Mean±SD**	**P value**
freeT3 (pg/ml)	2.43±1.44	2.6±1.77	0.001
freeT_4(pg/ml)	11.0 ±4.16	11.4±4.9	0.009
TSH (µIU/ml)	5.17±9.84	5.22±10.5	0.870

Discussion

In the present study more than half of the subjects are females indicating that more females are suffering from thyroid illness. This finding is supported by few studies (Friedman *et al.*, 1999; Ladenson *et al.*, 2000). The prevalence of thyroid disorders seen in this study was 29.0%. Similar study observed 30% of the population suffering from thyroid dysfunction in eastern Nepal. This prevalence may be due to geographical locations and pattern of iodine deficiency in these regions (Gelal *et al.*, 2009; Baral *et al.*, 2002; Niafar *et al.*, 2009). The worldwide prevalence of hypothyroidism in various studies shows a remarkable variation and current prevalence ranges from 1% to 20% for sub-clinical and 1-2% for overt hypothyroidism (Aminorroaya *et al.*, 2009). Though hypothyroidism is a common endocrine disorder, frequency and severity of the symptoms vary from patient to patient. Sign and symptoms reflect the numerous organ systems regulated by thyroid hormones No single clinical manifestation specially indicates thyroid dysfunction (Wang *et al.*, 1997).

Prevalence of thyroid dysfunction depends upon methodology, classification of hypothyroidism and community examined by age, ethnicity, gender, geographical distribution and environmental facts including iodine consumption (Baral *et al.*, 2002; Rohil *et al.*, 2010).In a study conducted by Aryal et al, 2010 in Dhulikhel district near Kathmandu valley, the prevalence of thyroid dysfunction was 25% with Hypothyroidism (8%), subclinical hypothyroidism (8%), subclinical hyperthyroidism (6%) and hyperthyroidism (3%)(Aminorroaya *et al.*, 2009). A study from estern Nepal reported prevalence of hypothyriodism (17.19%) and hyperthyroidism (13.68%) among thyroid dysfunction (Baral *et al.*, 2002) These findings support our study, which showed prevalence of thyroid disfunction (29%) with subclinical hypothyroidism (17%), hypothyroidism (8%) subclinical hyperthyroidism (1%) and hyperthyroidism (3%) (Niafar *et al.*, 2009).Studies in developed countries have shown, hypothyroidism tends to increase with age and is more common in women and people with goitre(22 Wang *et al.*, 1997). Hypothyroidism is generally autoimmune in origin, presenting either primary atrophic hypothyroidism or Hashimoto's thyroiditis and rarely pitutary or hypothalamic disorders can result secondary hypothyroidism (Mahato *et al.*, 2013). Although all age group presented with thyroid dysfunction, a higher number of subjects were observed in the age groups of 31-45 years. Hypothyroidism is the most common thyroid disorder in a larger group of population (Tunbridge *et al.*, 1977). One similar study, reported the mean age of patients with thyroid dysfunction to be approximately 39 years, which showed the accumulation and manifestation of disorder symptoms in this age group. Few studies have revealed that incidence of hypothyroidism increases with advancing age (Shaw *et al.*, 2006). In this study also the same trends reported. Children under 15 years have presented with hypothyroidism which may be associated with iodine deficiency disorder or Down's syndrome which ultimately retards physical and mental growth and development (Das *et al.*, 2007).Some studies have reported that obesity, diabetes, Metabolic Syndrome, and depression have association with thyroid dysfunction (Tunbridge *et al.*, 1977).

Conclusion

This study has revealed the prevalence of thyroid dysfunction typically hypothyroidism and sub clinical hypothyroidism, were higher in central Nepal. Epidemiological studies are needed to establish the accurate prevalence and predominant etiology of thyroid dysfunction in this region of the country. In addition, the role of depression, obesity and diabetes must be extensively studied and explicitly defined. The study recommends thyroid dysfunction screening and treatment campaigning in the general population of Nepal to reduce the burden of disease. The present study has identified the burden of thyroid dysfunction in the central region of Nepal and can

be used as baseline data for further studies. The prevalence based studies needs to be done to establish the reference intervals of thyroid hormones in Nepalese populations.

Limitations of the study

The present study is based on serum fT_3 fT_4 and TSH measurement. Total T_3,T_4, Thyroglobulin, anti-thyroperoxidase, anti-thyroglobulin (anti-Tg), TSH receptor antibodies and thyroid stimulating immuniglobulin (TSI) were not included to rule out thyroid disease. The cut-off values of thyroid hormones (fT_3 fT_4 and TSH) used was those recommended by the manufacturer of the kit, and other related studies as few studies are performed in these regions to establish the reference intervals of thyroid parameters in Nepalese population. This study is hospital based study, so it does not represent the general population.

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References

Aminorroaya A, Janghorbani M, Amini M, Hovsepian S, Tabatabaei A and Fallah Z (2009) The prevalence of thyroid dysfunction in an iodine-sufficient area in Iran. *Arch. Iran Med.* **12**(3): 262-270.

Ashworth L (1996) Medication use in the hypothyroid patient. Home Care Provide. **1**: 97

Baral N, Lamsal M and Koner BC (2002). Thyroid dysfunction in eastern Nepal. *South Asian J. Trop. Med. Public Health* **33**: 638-641.

Brownlie BE, Wells JE (1990) The epidemiology of thyrotoxicosis in NewZealand: incidence and geographical distribution in north Canterbury, 1983–1985. *Clin. Endocrinology* **33**: 249-59. DOI: 10.1111/j.1365-2265.1990.tb00489.x

Das BKL, Baral N, Shyangwa PM and *et al.* (2007) Altered serum levels of thyroxine, triiodothyronine and thyroid stimulating hormone in patients with depression. *Kathmandu Univ. Med. J.* **5**: 330-334.

Friedman MN (1999) Screening for thyroid disease. *Ann. Med.* **130**: 161-162. DOI: http://dx.doi.org/10.7326/0003-4819-130-2-199901190-00016

Gelal B, Aryal M, Das BKL, *et al.* Assessment of io-dine deficiency status among school age children of Nepal by urinary iodine assay. South Asian J Trop Med Public Health 2009; 40: 538- 543.

Helfand M, Redfern CC (1998). Clinical guideline, part 2.Screening for thyroid disease: an update. AmericanCollege of Physician. Ann Intern Med 1998; 129: 144-58. DOI: 10.7326/0003-4819-129-2-199807150-00020

International Council for Control of Iodine Deficiency Disorders, UNICEF. World Health Organization (2001) Assessment of iodine deficiency disorders and monitoring their elimination: a guide for programme managers. 2nd ed. Geneva: World Health Organization.

Ladenson Paul W (2000). American thyroid association guide-lines for detection of thyroid dysfunction. Arch Intern Med. 160: 1573-1575. DOI: 10.1001/archinte.160.11.1573

Mahato RV, Nepal AK, Gelal B, et al (2013). Spectrum of Thyroid Dysfunction in Patients Visiting Kantipur Hospital, Kathmandu, Nepal. *Mymensingh Med. J.* **22** (1): 164-169.

Niafar M, Aliasgharzadeh A, Bahrami A and *et al.* (2009) Prevalence of thyroid dysfunction in the elderly women of Iran. Endocrine Abstracts 2009, **20**: 137.

Parle JV, Franklyn JA, Cross KW and *et al.* (1992) Circulating lipid and minor abnormalities of thyroid function. *Clin. Endocrinology* **37**: 411-414. DOI: 10.1111/j.1365-2265.1992.tb02351.x

Peter PAS (2009) Epidemiology of Thyroid dysfunction-hypothyroidism and hyperthyroididm. *Thyroid International*. **2**: 1-16.

Risal P, Maharjan BR, Koju R, et al (2010) Variation of total serum cholesterol among the patient with thyroid dysfunction. *Kathmandu Univ Med J.* **8**: 265-268. DOI: http://dx.doi.org/10.3126/kumj.v8i2.3573

Rohil V, Mishra AK, Shrewastawa MK, Mehta KD, Lamsal M, Baral N and *et al.* (2010). Subclinical hypothyroidism in eastern Nepal: a hospital based study. *Kathmandu Univ. Med. J.* **8**(30): 231-237. DOI: 10.3126/kumj.v8i2.3565

Shaw CK, Thapalia A, Nanda S and Shaw P (2006). Thyroid dysfunction in Down syndrome. *Kathmandu Univ. Med. J.* 4: 182-186.

Surks MI, Chopra IJ, Mariash CN and *et al.* (1990). American thyroid association guidelines for use of laboratory tests in thyroid disorders. J A M A 263: 1529-1532. **DOI:** 10.1001/jama.1990.03440110095035

Tunbridge WMG, Evered DC, Hall R and *et al.* (1997). The spec-trum of thyroid disease in a community: the Whickham survey. *Clin. Endocrinol.* **7**: 481-483. DOI: 10.1111/j.1365-2265.1977.tb01340.x

Vanderpump MP and Tunbridge WM (2002). Epidemiology and prevention of clinical and subclinical hypothyroidism. *Thyroid*. **12**: 839-847. DOI: 10.1089/105072502761016458

Wang C, Crapo LM (1997). The epidemiology of thyroid disease and implications for screening. Endocrinol Metab Clin North Am. 26(1):189-218. DOI: 10.1016/S0889-8529(05)70240-1

Wiersinga WM (1995) Subclinical hypothyroidism and hyperthyroidism. Prevalence and clinical relevance. Neth J Med. 46:197-204. DOI: 10.1016/0300-2977(94)00089-R