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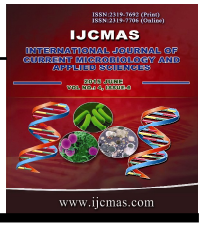

Original Research Article

A Hospital Based Prevalence Study on Thyroid Disorders in Malwa region of Central India

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K e y w o r d s

Clinical Hypothyroidism, Subclinical Hypothyroidism, Clinical Hyperthyroidism, T3, T4, TSH

A B S T R A C T

The scope of the research is to carry out a hospital based study to find out the incidence of thyroid disorders in central India. We studied 28,677 patients who were turned out to our hospital for thyroid hormone profile tests during the period of January 2008 to December 2012. The incidence of thyroid disorders and its relationship with the different age groups and gender were investigated. 84.65% of subjects having thyroid hormone profile within normal range who are to be categories as Euthyroid. In our present study 7.45% subjects had TSH value more than 10µIU/ml, considered as clinical hypothyroidism. Among those clinical hypothyroid patients 24.07% were males and 75.92% were females. In this study, 6.31% of subjects were suffering with subclinical hypothyroidism, having TSH value in between 4.94 and 10µIU/ml. Among the cases of subclinical hypothyroidism 25.11% were male and 74.88% were females. The incidence of clinical hyperthyroidism in our study was in lower side (1.79%) and out of those hyperthyroid cases 33.01% were male and the females were 66.99%. We find out in our study that the incidence of all three types of thyroid disorders in age group between 19 and 45 years was highest. In present study, the incidence of subclinical hypothyroidism in age group of 45 years or more was also in the higher side (41.93%). The study suggested that the prevalence of thyroid disorders in central India is very high and women between 19 and 45 years of age are more prone to these disorders.

Introduction

Diseases of the thyroid gland are among the most abundant endocrine disorders worldwide second only to diabetes, India is no exception. Recent report shows that 300 million people in the world are suffering from thyroid disorders and among them about 42 million people resides in India (Nimmy NJ *et al.*, 2012). Thyroid disease is being increasingly diagnosed with greater awareness and is one of the chronic non-communicable disease affecting women more, though male population is not spared of the ailment. In areas with relatively high iodine intake, hypothyroidism is commoner

than hyperthyroidism (Laurberg P *et al.,* 1999). Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of myxoedema, end organ effects and multisystem failure to an asymptomatic or subclinical condition with normal levels of thyroxin (T4) and tri-idothyronine (T3) but mild elevated levels of serum TSH (Kochupillai N *et al.,* 2000, Laurberg P *et al.,* 1998, Fatourechi V 2006, Unnikrishnan AG *et al.,* 2013) Reliable data are required for accurate interpretation of thyroid function test.

The prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake (Kochupillai N *et al.,* 2000). India adopted salt iodinization program in 1983 (Tiwari BK *et al.,* 2006). In 2004, World Health Organization (WHO) assessment status classified India as having optimal iodine nutrition (Iodine status worldwide 2004, Andersson M *et al.,* 2005).

Serum TSH measurement is the most important and sensitive test for screening of Hypothyroidism because, serum TSH has a Log –Linier relationship with circulating thyroid hormone levels; a twofold change in Free Thyroxin (FT4) will produce a 100 fold change in TSH (Fatourechi V 2006).

Signs and symptoms of overt hyper and hypothyroidism are well known, subclinical thyroid conditions have subtle clinical manifestations and may mimic other diseases. Hence, it is important to develop rational laboratory strategies to differentiate the various conditions to guide the physician towards correct diagnosis and treatment (Heuck CC *et al.,* 2000, Vanderpump MP *et al.,* 2002).

For the management strategies of health care programs, it is necessary to know the prevalence of the hypo and hyper thyroid disorders in the regional population. Data available on the prevalence of hypo and hyperthyroidism for Indian population is scanty (Unnikrishnan AG *et al.,* 2013). True population surveillance is difficult and hence, presently it was aimed to carry out hospital based study on the incidence of thyroid disorders.

Materials and Methods

The state of Madhya Pradesh is second largest state in India by area and is also known as "heart of India" due to its geographical location (22.42ºN 72.54ºE). By population it is the sixth among the 28 states in India. As per census of 2011, the population of the state was 72,626,809 (approximately 6% of the total population of India); of which 37,612,306 (approximately 52%) were male and 35,014,503(approximately 48%) were female. Indore is the largest city in Madhya Pradesh as well as the economic capital of the state. The population of Indore and adjoining areas is 3,276,697 according to the 2011 census report of India (www.census2011.co.in).

Choithram Hospital and Research Centre is one of the leading hospitals in Madhya Pradesh and the patients turn up to the "Out Patients' Department" (OPD) from different parts of the state. The study included 28,677 OPD patients suspicious of thyroid disorders and referred to Pathology department during the period January 2008 to December 2012 for the assessment of thyroid hormone profile. The study population includes 11,168 (38.94%) males and 17,509 (61.06%) females. The study proposal was reviewed by the hospital Ethical Committee which has guidelines based on Helsinki deceleration.

The serum sample of all the individual with suspicion of thyroid dysfunction were

subjected to thyroid profile (Total T_4, Total T_3, Free T_4, Free T_3 and TSH) using Abbott ARCHITECT i1000SR (Abbott Laboratories, Diagnostics Division, Abbott Park, IL, USA) analyzer based on a Chemiluminescent Microparticle Immunoassay (CMIA) for the quantitative determination of thyroid hormone profile (Kalani M *et al.,* 2012). The normal ranges of thyroid hormone profile are show in Table1. In sample size calculation for 95% confidence interval and significance level α=5%, P=35%, Q=65%, allowable error=0.6%, required sample size was 26,668. The data collected were analyzed using Excel 2007, R2.8.0 Statistical Package for Social Sciences (SPSS) for windows version 16.0 (SPSS Inc.; Chicago, IL, USA). We calculated the odds ratio (OR) and their 95% Confidence Interval (95% CI). $P \leq 0.05$ is considered as statistically significant.

Results and Discussion

Out of 28,677 suspected thyroid disorder cases 24,274 (84.65%) had normal levels of Total T_4, Total T_3 and TSH and hence were grouped as euthyroid. Two thousand one hundred and thirty nine (7.45%) subjects showed elevated level of TSH and low levels of total T_3 and total T_4 in blood serum. Signs and symptoms of hypothyroidism were noted among them and therefore grouped as cases of clinical hypothyroidism. Among those clinical hypothyroid patients 515 (24.07%) were males and 1624 (75.92%) were females. The distribution of various thyroid disorders is depicted in Fig 1and the gender wise thyroid disorders is shown in Fig 2. The overall frequency of thyroid disorders along with percentage and 95% CI are described in Table 2 while gender wise distribution given in Table 3A and 3B. The year wise graphical presentation of male and female clinical hypothyroid patients is shown in Fig 3. Subclinical hypothyroidism was detected in 1,760 cases who had no significant clinical signs and symptoms of hypothyroidism but the serum TSH level was elevated but exhibited normal range of T_3 and T_4 levels. Among 1,760 cases of subclinical hypothyroidism 442 (25.11%) were male and 1318 (74.88%) were females. Five hundred and fifteen (1.79%) cases had signs and symptoms of hyperthyroidism and the laboratory findings of thyroid profile showed significant elevation of total T_3, total T_4 and free T_4 levels in blood serum and low levels of TSH. Out of 515 hyperthyroid cases 170 (33.01%) were male and 345 (66.99%) were females.

The thyroid disorder cases were divided in four age groups to determine the occurrence of various thyroid disorders in different age groups (Table 4). The age group division was less than 5 years, 5 to 18 years, 18 to 45 years and more than 45 years.

In the age group of less than 5 years, 136 (6.36%) were clinical hypothyroid, 53 (3.01%) were subclinical hypothyroid and no clinical hyperthyroid patient (0%) was found. In the age group of 5 to 18 years, the incidence of all the three thyroid disorders was in the range of 8.46% to 9.9%. The highest incidence of the three disorders was noted in the age group 19-45 years and ranged from 45.04% to 60.78%. The presence of subclinical hypothyroidism was more common (41.93%) among the age group more than 45 years.

Data on the prevalence of thyroid disorders in India is relatively scanty. Many of the studies carried out to determine the effectiveness of iodinization program. However, WHO assessment status classified India having optimal iodine nutrition (Iodine status worldwide 2004, Andersson M *et al.*, 2005) and hence iodine deficiency does not seem to play important role for thyroid disorders presently for India.

The present study is hospital based and includes 28,677 subjects during the period of 2008 to 2012. The incidence of clinical hypothyroidism was 7.45%, subclinical hypothyroidism was 6.31% and clinical hyperthyroidism noted among 1.79% subjects in present study. A hospital based study was conducted by Yadav *et al.* (2013), in western region of Nepal, and reported the occurrence of overt hypothyroidism of 1% which is much lower than our findings where as the incidence of subclinical hypothyroidism was 7.9% and is much similar to our data (Yadav NK *et al.,* 2013). Another hospital based study carried out on women of Pondicherry, India showed 1.2% of overt hyperthyroidism which resemble with our finding [Abraham R *et al.,* 2009]. Yet another hospital based study on 150 tribal women of the Bastar region of Chattisgharh, India showed much higher prevalence of all three types of thyroid disorders than in the present study (Skaria LK *et al.,* 2011).A study conducted at tertiary care centers in Ujjain, Madhya Pradesh, India support our data on Clinical Hypothyroidism and clinical hyperthyroidism where as the subclinical hypothyroidism reported almost four times than our findings (Jatwa J and Ismail B 2012).

Population surveillance has been carried out in a few centers in India and the incidence of thyroid disorders were reported to be in higher than the present data. A study conducted in Cochin, Kerala in 2011 on 971 adult individual, showed the prevalence of overall hypothyroidism as 13.3% which underpin our study result (Unnikrishanan AG and Menon UV 2011). An epidemiological study from Cochin, Kerala, reported that the overt hyperthyroidism was present in 1.3% (Usha Menon V *et al.,* 2009). We also reported the 1.79% incidence of clinical hyperthyroidism in our study population. A multi-centric study conducted by Unnikrishanan et al. (2013), in eight major cities in India, tried to portray nationwide data on the prevalence of thyroid disorders in the adult population in urban area. Their study shows the occurrence of hypothyroidism in urban population was about 11% and they nullify the incidence of iodine deficient thyroid disorders in urban areas of Indian population (Unnikrishnan AG *et al.,* 2013).

The present study suggests hypothyroidism as more common features of thyroid disorders and female to male ratio was approximately 3:1 and the age group of 19-45 years had the higher incidence was of hypothyroidism. These observations hence are similar to other studies (Unnikrishnan AG *et al.,* 2013, Jatwa J and Ismail B 2012).

Subclinical hypothyroidism was detected among 6.13% in the present study population and 75.88% of them were females and 45.04% of them were in the age group of 19-45 years whereas 41.93% were more than 45 years of age. Data on the incidence of subclinical hypothyroidism appears to be scantier in India and the present data strongly suggests increase more awareness among clinicians to detect these cases.

Hyperthyroidism had the lowest incidence among thyroid disorders in the present study and is comparable to other studies (Abraham R *et al.,* 2009). The year wise incidence of hypothyroidism (Table 3) in the present study shows increasing year wise trend and is possibly due to increasing awareness over the period. Thus the present study reflects the prevalence of thyroid disorders in central India. Since iodine deficiency is not an influential issue now, one should consider gene mutations at the molecular levels and the further studies need to be carried out to address this issue.

Table.1 Normal values of different parameters of thyroid profile

Parameters	Normal Values
Total T3	60-181 ng/dl
Total T4	4.5-12.6 µg/dl
TSH	0.35-4.94µIU/ml
Free T4	0.7-1.48 ng/dl
Free T3	1.71-3.71 ng/dl

Table.2 Overall distribution of thyroid disorders

N=28,677				
Thyroid Disorders	**Frequency**	**Percentage (%)**	**95% CI**	
			Lower	**Upper**
Euthyroidism	24,274	84.64	84.22	85.06
Clinical Hypothyroidism	2,139	7.45	7.15	7.25
Subclinical Hypothyroidism	1,760	6.31	6.03	6.59
Clinical Hyperthyroidism	515	1.79	1.64	1.94

Table.3A Distribution of Thyroid Disorders in Males

Thyroid Disorders	**Frequency**	**Percentage (%)**	**95% CI**	
			Lower	**Upper**
Clinical Hypothyroidism (N=2139)	515	24.07	22.26	25.88
Subclinical Hypothyroidism (N=1760)	442	25.11	23.08	27.14
Clinical Hyperthyroidism (N=515)	170	33.01	28.95	37.07

Table.3B Distribution of thyroid disorders in females

Thyroid Disorders	**Frequency**	**Percentage (%)**	**95% CI**	
			Lower	**Upper**
Clinical Hypothyroidism (N=2139)	1624	75.92	74.11	77.73
Subclinical Hypothyroidism (N=1760)	1318	74.88	72.85	76.91
Clinical Hyperthyroidism (N=515)	345	66.99	62.93	71.05

Table.4 Distribution of thyroid disorders according to age

	Clinical Hypothyroidism	Subclinical Hypothyroidism	Clinical Hyperthyroidism
< 5 Years			
Frequency	136	53	0
Percentage	6.36	3.01	0
95% CI	(5.33,7.39)	(2.21,3.81)	(0,0)
5-10 Years			
Frequency	181	170	51
Percentage	8.46	9.66	9.9
95% CI	(7.28,9.64)	(8.28,11.04)	(7.32,12.48)
19-45 Years			
Frequency	1182	799	313
Percentage	55.26	45.04	60.78
95% CI	(53.15,57.37)	(42.72,47.36)	(56.56,65.0)
>45 Years			
Frequency	640	738	151
Percentage	29.92	41.93	29.32
95% CI	(27.98,31.86)	(39.62,44.24)	(25.39,33.25)

Figure.1 Distribution of Different Thyroid Disorders (N=28,677)

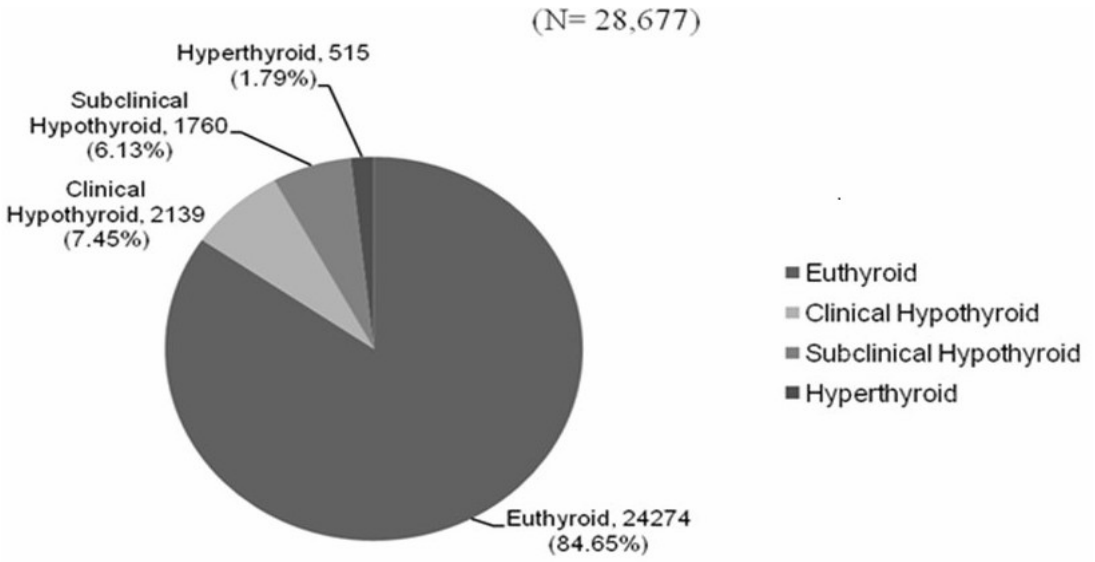


Figure.2 Gender wise Distribution of Thyroid Disorders

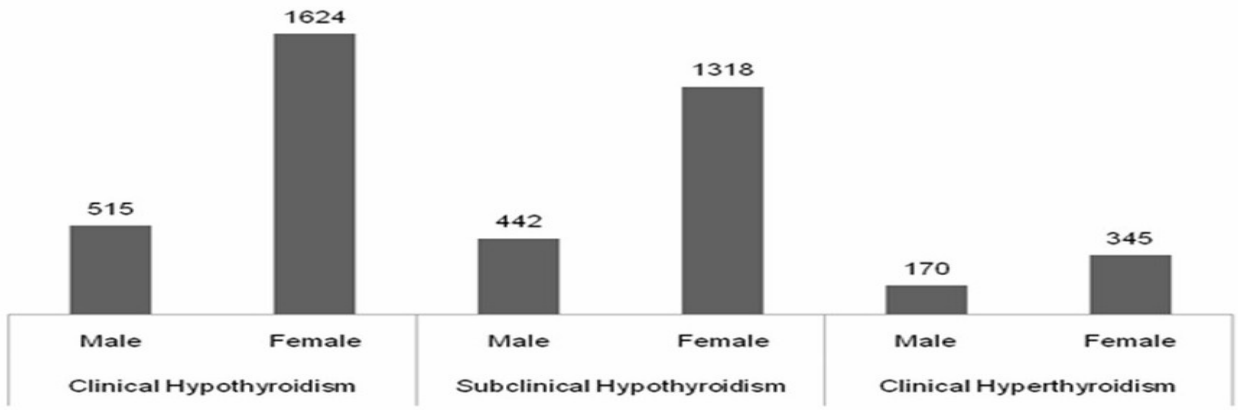
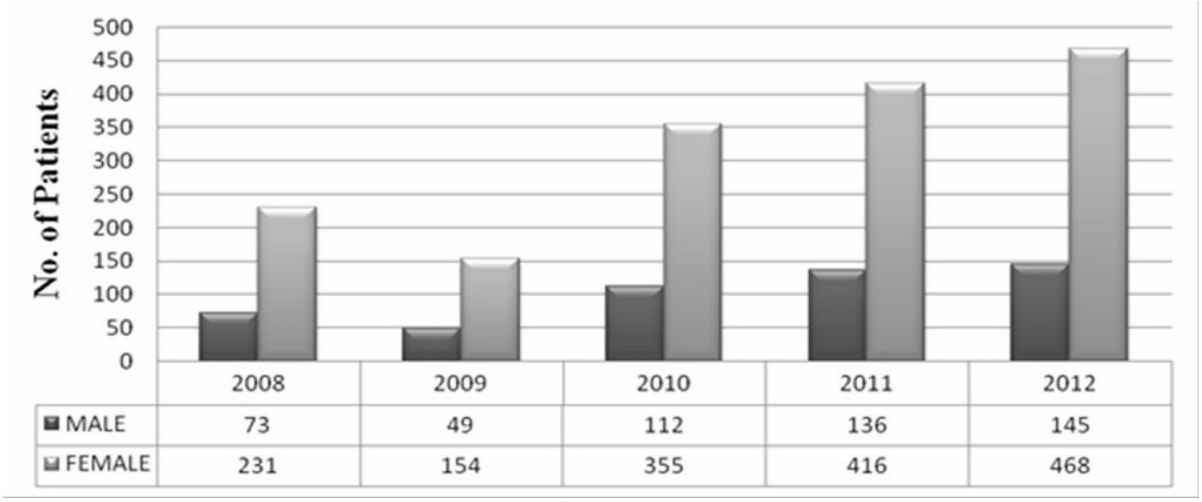


Figure.3 A Gender wise Data Presentation of Clinical Hypothyroidism (from year 2008 to 2012)



In conclusion, this study suggested that the prevalence of thyroid disorders in central India is high and the hypothyroidism is more common than hyperthyroidism. The prevalence of subclinical hypothyroidism is also high. And the study revealed that the women between 19 and 45 years are more prone to thyroid disorders.

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References

Abraham R, Murugan VS, Pukazhvanthen P, Sen SK. (2009) Thyroid disorders in women of Puducherry. Indian J Clin Biochem. 24: 52-59.

Abraham R, Murugan VS, Pukazhvanthen P, Sen SK. (2009)Thyroid Disorders In Women of Puducherry. Indian J Clin Biochem. 24:52-59

Andersson M, Takkouche B, Egli I, Allen HE, Benoist B. (2005) Currentglobal iodine status and progress over the last decade towards the elimination of iodine

deficiency. Bull World Health Organ. 83:518-525.

Heuck CC, Kallner A, Kanagasabapathy AS, Riesen W. WHO Document (WHO/DIL /00.4) on "Diagnosis and monitoring of diseases of the thyroid", (2000).

http//www.census2011.co.in/census/state/Madhya+Pradesh.html (2011)

Iodine status worldwide, WHO global database on iodine deficiency, Department of nutrition for health and development. Geneva: WHO; (2004).

Jatwa J and Ismail B. (2012) Studies on Human Thyroid disorders based upon Assay of TSH and Thyroid hormones in Ujjain, MP, India. ISCA Journal of Biological Sciences. 1(2):43-47

Kalani M. Kahapola-Arachchige, Narelle Hadlow, Robert Wardrop, Ee M. Lim, John P. (2012) Age-specific TSH Reference Ranges Have Minimal Impact on the Diagnosis of Thyroid Dysfunction. Walsh Disclosures Clin Endocrinol. 77(5):773-779.

Kochupillai N. (2000) Clinical endocrinology in India. Current Science. 79: 1061-1067.

Laurberg P, Bülow Pedersen I, Pedersen KM, Vestergaard H. (1999) Low incidence rate of overt hypothyroidism compared with hyperthyroidism in an area with moderately low iodine intake. Thyroid. 9(1):33-38

Laurberg P, Pedersen KM, Hreidarsson A, Sigfusson N, Iversen E and Knudsen PR, (1998) Iodine intake and the pattern of thyroid disorders: a comparative epidemiological study of thyroid abnormalities in the elderly in Iceland and in Jutland, Denmark. J Clin Endocrinol Metab. 83:765-769

Nimmy NJ, Aneesh PM, Narmadha MP, Udupi RH, Binu KM. (2012) A Survey on Prevalence of Thyroid Disorders Induced by Demography and Food Habits in South Indian population. Indian Journal of Pharmacy Practice, 5:49-52

Skaria LK, Sarkar PD, Agnihotram G, Thakur AS, Pamidamarri G. (2011) Thyroid Dysfunctions in Tribal Women of the Bastar Region of Chattisgharh, IndiaThyroid Science. 6(6):1-5

Tiwari BK, Ray I, Malhotra RL. (2006) Policy Guidelines on National Iodine Deficiency Disorders Control Programme-Nutrition and IDD Cell. Directorate of Health Services, Ministry of Health and Family Welfare. New Delhi: Government of India; 1-22.

Unnikrishanan AG and Menon UV. (2011) Thyroid disorders in India; An epidemiological perspective. Indian Journal of Endocrinology and Metabolism. 15:S78-S81

Unnikrishnan AG, Kalra S, Sahay RK, Bantwal G, John M, Tewari N. (2013) Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. Indian J Endocrinol and Metab. 17(5):647-652

Usha Menon V, Sundaram KR, Unnikrishnan AG, Jayakumar RV, Nair V, Kumar H. (2009) High prevalence of undetected thyroid disorders in an iodine sufficient adult south Indian population. J Indian Med Assoc. 107:72-77

Vahab Fatourechi, (2006) What is normal TSH? Mayo Clinic college of Medicine, US.

Vanderpump MP, Turnbridge WM. (2002) Epidemiology and prevention of clinical and subclinical hypothyroidism. Thyroid. 12:839-847.

Yadav NK, Thanpari C, Shrewastwa MK, Sathian B, Mittal RK. (2013) Socio demographic wise risk assessment of thyroid function abnormalities in far western region of Nepal: A hospital based descriptive study. Asian Pac J Trop Dis. 3(2): 150-154