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PROPORTION OF THYROID DISEASES IN JHARKHAND

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ABSTRACT: Thyroid disorders are an important public health issue in India and across worldwide. Earlier it has been reported that around 42 million people in India are suffering from thyroid disease. Although easy to detect and not very expensive to treat, this disease often remain undetected and untreated and thus affects other systems of the body. Studies from various research workers discuss the proportion of thyroid disorder among Indian states like Delhi, Mumbai, Kolkata, Bangalore, Chennai, Goa etc. but it has been found that till now no such study have been reported in Jharkhand, which is iodine deficient area and this confers to greater chance of thyroid disease among the state. In view of above a retrospective study has been made and it has been found that thyroid disorder is more prevalent in females compared to males. The proportion of overt hypothyroidism is 6.0%, 13.7% of subclinical hypothyroidism, 3.4% of overt hyperthyroidism, 2.9% of subclinical hyperthyroidism, and 74% of Euthyroidism in total population. Negative association among free T3 and TSH and free T4 and TSH has been also found. The study is the first effort from Jharkhand towards the proportion of thyroid disorder. Being iodine deficient area as well, proper awareness is required for the control of disease so that its prevention and associated diseases can be minimized.

INTRODUCTION: Thyroid disorders are among the commonest endocrine disorders in India as well as across the world. Thyroid hormones have pervasive effects on growth and development in the fetus, child and adolescent regulating calorigenesis and metabolic rate throughout the life. Thyroid functions are controlled by negative feedback mechanism regulating thyroid hormone secretion. The level of thyroid hormone above or below the normal reference range may result in thyroid disorder.

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The scope of thyroid disorder span from underneath hypothyroidism to more active hyperthyroidism. The proportion of thyroid disorder has been made by many research workers worldwide [1-6]. In majority of the studies the proportion of hypothyroidism is found to be more as compared to others being mostly among females. The abnormal thyroid is associated with many diseases and complications.

Hypothyroidism may contribute to clinical depression [7-9], elevated serum cholesterol levels, impaired fertility [10], increased risk of miscarriage. Subclinical hypothyroidisms may confer higher risk of cardiovascular mortality [11], heart failure and coronary heart disease [12] and if left untreated sometimes because of lack of clinical features may lead to overt hypothyroidism. Hyperthyroidism

contributes to congestive heart failure, myopathy, palpitation, weight loss, dyspnea, and if left term untreated can lead to osteoporosis. Thyrotoxicosis is a serious emanation of hyperthyroidism corresponding to overt tissue exposure to excess circulating thyroid hormones. Subclinical hyperthyroidism may reduce the incidence of atrial fibrillation [13]. It also causes an increased risk of bone fractures (by 42%) in people with subclinical hyperthyroidism. Euthyroidism refers to normal production of thyroid hormones by the thyroid gland and normal levels in the circulation and at cellular level. Jharkhand, preceding region of Bihar is a mountainous landlocked area, situated far away from sea.

The geographical location of the state along with optimal annual rainfall leads to a low soil iodine content. Previous studies by Patro et al.[14] have also concluded Jharkhand to be iodine deficient area. Studies from various research workers have shown that the proportion of thyroid disorder has been done for different states of India [15-22] but it appears that there has been no study carried out at Jharkhand. In view of above a study has been made to estimate the proportion of thyroid disorder in Jharkhand.

MATERIALS AND METHODS:

Patient and Study design: A hospital based retrospective study from December 2013 to November 2015 comprising of 9890 subjects have been made. Thyroid function test encompassing of analysis of free T3, free T4 and TSH have been done among patients referred from both in and out patient departments of RIMS, Ranchi, Jharkhand, India. The candidates were both male and female ranging from age group of 1 day to 95 years. They have undergone thyroid function test. There were 9890 subjects, among them 7780 were females and 2110 were males. The investigation was done in the Department of Biochemistry and data analysis was done at Biomedical Informatics Centre under Department of Biochemistry, RIMS, Ranchi, India. The reference range of thyroid hormones is given as:

- Free T3: 1.71 - 3.71 pg/mL
- Free T4: 0.70 - 1.48 ng/dL
- TSH: 0.3500 - 4.9400 uIU/mL

Blood Sample Collection:

To each participant, tourniquet was applied in the arm and blood was taken from antecubital vein of the patients. Blood was collected in plain vials without any additives. It was allowed to clot for 30 minutes. After clot formation the blood was centrifuged at 3000 rpm for 10 minutes. Serum was separated from cells and collected in a separate aliquot vial and labeled carefully. It was stored at 2-8 ^{0}C in refrigerator and serum concentrations of free T3, free T4 and TSH were assessed on the next day in Abbott *i1000* SR by enhanced chemiluminescence method. Thyroid status was defined as:

- Euthyroid (fT3, fT4 and TSH levels are in normal reference range)
- Hypothyroidism (fT3 or fT4 levels are low and TSH level is high)
- Subclinical Hypothyroidism (fT3 and fT4 levels are in normal range and TSH level is high)
- Hyperthyroidism (fT3 or fT4 levels are high and TSH level is low)
- Subclinical Hyperthyroidism (fT3 and fT4 levels are in normal range and TSH level is low)

Statistics: The data were entered in electronic medical record formed at BMIC, Dept. of Biochemistry RIMS, Ranchi and was analyzed by using the SPSS software package, version 20.0 (SPSS Inc., Chicago, IL, USA) for windows. The data were expressed as mean ± SD. A student's t-test was used to determine the effect of gender and age in thyroid disorder. Chi square tests were used for comparison when appropriate. Pearson corelation was used to determine the association between the variables. P-value of <0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION: The proportion of thyroid disorder has been calculated among total population, females and males. It has been found

that there is statistically significant difference between disorders in both the gender (p value 0.007) and age (p value <0.0001).

TABLE 1: PROPORTION (%; AND 95 % CONFIDENCE INTERVAL) OF THYROID DISORDERS IN TOTAL POPULATION

Age In years	Total	Euthyroidism	Hyperthyroidism	Hypothyroidism	Subclinical Hypothyroidism	Subclinical Hyperthyroidism	p value
1-10	81	59	1	8	12	1	<0.0001
11-20	717	567	18	35	79	18	
21-30	2207	1688	70	128	275	46	
31-40	2218	1557	79	138	363	81	
41-50	1567	1147	47	89	241	43	
51-60	688	493	29	41	102	23	
61-70	240	179	6	15	30	10	
71-80	57	44	2	2	8	1	
81 onwards	5	3	0	0	2	0	

From **Table 1**, the proportion of thyroid disorder (95% confidence interval) can be observed. Of 9890 subjects, the proportion of subclinical hypothyroidism is 10.4 %, hypothyroidism 4.5 %, 2.5% hyperthyroidism, 2.1% subclinical hyperthyroidism, and 54.4 % Euthyroidism among age group of 21-50. Among age group of 1-20, the proportion of Euthyroidism is 8.7 %, hypo is 0.6%, hyper is 0.6 %, subclinical hypothyroidism is 1.3 %, subclinical hyperthyroidism is 0.3 %.

Among older age group 51-70, the proportion of Euthyroidism is 10.1 %, hypothyroidism is 0.9 %, hyperthyroidism is 0.5 %, Subclinical hypothyroidism is 1.8 %, Subclinical hyperthyroidism is 0.4 %. Among very old age group, 71 onwards, the proportion of Euthyroidism is 0.8 %, subclinical hypothyroidism is 0.2%, subclinical hyperthyroidism is 0.1% and almost negligible cases of hypothyroidism and hyperthyroidism. This might be due to the fact the pool size is very small among very old age group.

TABLE 2: PROPORTION (%; AND 95 % CONFIDENCE INTERVAL) OF THYROID DISORDERS AMONG MALES

Age In years	Total	Euthyroidism	Hyperthyroidism	Hypothyroidism	Subclinical Hypothyroidism	Subclinical Hyperthyroidism	P value
1-10	109	88	1	0	20	0	.020
11-20	196	143	8	18	19	8	
21-30	438	337	23	27	42	9	
31-40	465	342	19	35	54	15	
41-50	419	310	14	27	53	15	
51-60	254	186	14	16	29	9	
61-70	179	141	4	15	17	2	
71-80	43	32	1	1	5	4	
81 onwards	7	4	0	0	3	0	

TABLE 3: PROPORTION (%; AND 95 % CONFIDENCE INTERVAL) OF THYROID DISORDERS AMONG FEMALES

Age In years	Total	Euthyroidism	Hyperthyroidism	Hypothyroidism	Subclinical Hypothyroidism	Subclinical Hyperthyroidism	P value
1-10	190	147	2	8	32	1	0.007
11-20	913	710	26	53	98	26	
21-30	2645	2025	93	155	317	55	
31-40	2683	1899	98	173	417	96	
41-50	1986	1457	61	116	294	58	
51-60	942	679	43	57	131	32	
61-70	419	320	10	30	47	12	
71-80	100	76	3	3	13	5	
81 onwards	12	7	0	0	5	0	

The number of females is more as compared to number of males. Among females and males (see **Table 2** and **3**) it was observed that the proportion of thyroid disorder is highest in age group of 21- 50 as compared to other decades of life. In males (see **Table 2**) the proportion of hyperthyroidism is 2.7 % which is high compared to females which is 2.5 %. The proportion of hypothyroidism, subclinical hypothyroidism and subclinical hyperthyroidism is high among females as compared to males being 4.6%, 11.3% and 2.2% as compared to that of males being 4.2 %, 7.1 % and 1.8 % respectively which is in accordance to the findings of Olmos [23] and Aquino [24].

In the age group of 1-20, the proportion of thyroid disorder is more in case of males than in females being 0.4 % and 0.2 % of hypothyroidism, 0.9% and 0.6% of hypothyroidism, 1.8% and 1.2% of subclinical hypothyroidism and 0.4 % and 0.2 % of subclinical hyperthyroidism in males and females respectively. In the age group of 51-60 also the proportion of thyroid disorder is more in males as compared to that of females being 0.9 % and 0.4 % of hyperthyroidism, 1.5% and 0.7% of hypothyroidism, 2.2% and 1.7% of subclinical hypothyroidism respectively among males and females which is consistent with the findings of researchers [25, 26]. However Anderson et. al. [27] found a stable proportion among both the gender over age 60 years of age. In both the genders among very old age group since the sample size is small comment on the proportion of thyroid disorder cannot be made.

TABLE 4: PROPORTION (%; AND 95 % CONFIDENCE INTERVAL) OF THYROID DISORDERS ACCORDING TO GENDER

Thyroid Disorders	All (N=9890)		Females (N= 7780)		Males (N= 2110)		P value
	N	%	N	%	N	%	
Hyperthyroidism	336	3.4%	252	2.5%	84	.8%	0.007
Hypothyroidism	595	6.0%	456	4.6%	139	1.4%	
Subclinical Hypothyroidism	1354	13.7%	1112	11.2%	242	2.4%	
Subclinical Hyperthyroidism	285	2.9%	223	2.3%	62	.6%	

It can be observed that proportion of thyroid disorder significantly varies with both age and gender (see **Table 4**). Among the total population studied the burden of thyroid disorder is 26 %, comprising of 20.7 % in females and 5.3 % in males. The proportion of thyroid disorder among age group of 21-50 is greater in females as compared to males and is also consistent with the finding of research workers, Sawin [28], Gunter [29], Ikem [30] and which is also supported in the literature. The proportion of hypothyroidism is more (6%) as compared to hyperthyroidism (3.4 %) in the study. The incidence of high proportion of hypothyroidism is also been reported by research workers [31, 28, 32].

Among the total population studied, 13.7 % was of subclinical hypothyroidism, 6.0% of hypothyroidism, 3.4 % of hyperthyroidism and 2.9 % of subclinical hyperthyroidism. The important limitation of the study is the normal reference range used for the hormonal assay were provided by the manufactures of the kit as we have no specific reference range for our state, secondly anti-thyroperoxidase antibody were not assayed and among very old age group the sample size was very small. There is gender specific response to thyroid hormone profile with ageing. Subclinical hypothyroidism is the commonest disorder of thyroid followed by hypothyroidism. Being iodine deficient area as well, proper awareness and understanding is required for the control of disease so that its prevention and associated diseases can be minimized.

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