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REVIEW ARTICLE

SOCIODEMOGRAPHIC WISE RISK ASSESSMENT OF THYROID FUNCTION ABNORMALITIES IN GUNTUR REGION: A LABORATORY BASED DESCRIPTIVE STUDY

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ABSTRACT

Thyroid gland is an essential organ, which plays wide and vital biological roles in the body. The thyroid hormones distress all body organs and are accountable for maintenance of homeostasis and the body integrity. **Methods:** A total of 5400 individuals (77 males and 447 non pregnant women) were involved in the study was conceded out using data retrieved from the laboratory. The variables collected were age, gender, and thyroid function profile including T3, free T4 and TSH. **Results:** The proportion of thyroid ailment is 9.7% in Guntur region. The entire hyperthyroidism in this region is 19.6% followed by subclinical hyperthyroidism 12.7% and clinical hyperthyroidism 6.87%. Thyroid dysfunction is high in females, (8.2%) stalked by males 1.42%. In females subclinical hypothyroidism is more (49.2%) tailed by overt hypothyroidism, subclinical hyperthyroidism, clinical hypothyroidism, and clinical hyperthyroidism 11.6%, 10.3%, 7.8% and 6.3% correspondingly.

INTRODUCTION

The thyroid gland is a butterfly shaped vital organ with two lobes connected by an isthmus of the inferior part of the neck. It weighs around 10-30 grams in individuals with satisfactory iodine consumption [2]. It plays extensive and physiological roles in the body. The thyroid hormones affect all body organs and are accountable for upkeep of homeostasis [1]. Thyroid produces and stores two hormones 80% thyroxine (T4) and 20% triiodothyronine (T3) [3,2]. The thyroid complaints may be due to hereditary issues, a genetic predisposition, derisory levels of nutritional iodine intake, gravidity, radiotherapy, viral toxicities, surgery, underlying diseases such as infiltrative disorders, or even autoimmunity. Thyroid ailments are the commonest endocrine complaints worldwide [4]. Numerous studies on thyroid illness revealed that in India by 2011 about 42 million individuals in India suffering with thyroid illness and thyroid sickness may increase to 60 million by the year 2026 [5]. The foremost thyroid illnesses are hypothyroidism and hyperthyroidism, which have been stated in over 110 nations of the world with 1.6 billion people at peril [6].

Iodine is vital micronutrients obligatory for ideal functioning of thyroid gland and central nervous system. Iodine is necessary for the production of the thyroid hormones, thyroxine (T4) and triiodothyronine (T3) [7]. Thyroid disorders arise primarily due to iodine dearth [3]. The only natural source of iodine is the nutrition. However, in numerous parts of the world iodine supply from natural sources is inadequate, resulting in iodine deficiency disorders [8]. Almost one-third of the world's population live in zones of iodine deficiency [6]. It is evaluated that about 200 million people are at the threat of iodine deficiency in our country [9]. It has been projected that 0.2% of the deceases in India result from endocrine sicknesses, among which iodine scarcity has been a major cause [4]. Severe iodine shortage results in hypothyroidism, endemic goiter and cretinism, endemic mental retardation, decreased fertility, augmented prenatal death, and infant mortality [10]. High iodine consumption is linked with lesser occurrence of goiter and higher incidence of hypothyroidism. Low ingestion is connected with a higher frequency of hyperthyroidism [11]. Hyperthyroidism and hypothyroidism together account for considerable indisposition [7]. There is immense burden of thyroid disease in the entire population. The process of aging affects both the incidence clinical presentation of hypo- and hyperthyroidism [12].

Hypothyroidism is defined as a deficiency of both T3 and T4 causing in reduced thyroid activity [13]. Hypothyroidism, precisely, is the most common of thyroid disorders in India, affecting one in ten adults [14]. In adults 8-10 times more common in women than men and its incidence upsurges with age [11]. The pervasiveness of hypothyroidism in the industrialized world is about 4-5% [91] and in India is 11% [14]. Compared with shoreline cities, towns located inland have a higher prevalence (11.7 vs 9.5%) [14] of hypothyroidism [14]. The frequency of subclinical hypothyroidism, which is characterized by normal free thyroxine (FT4) and elevated thyrotropin (TSH) levels, rises with aging and ranges from 3 to 16% in individuals aged 60 years and older [12].

Diabetic patients have higher prevalence of thyroid disorder when compared with the non-diabetic population with hypothyroidism being the most common disorder [3]. Diabetic women are more often affected than men and hypothyroidism is more common than thyrotoxicosis. It has been showed that subclinical hypothyroidism affects nearly one in 20 women with type 2 diabetes [17].

Thyroid disorders are more recurrent in women than in men [18]. Thyroid hormones play a crucial role in the menstrual and reproductive function of women. Thyroid dysfunction is related with menstrual irregularities in females of all age groups. These menstrual aberrations can be polymenorrhoea, menorrhagia, meno-metrorrhagia, inter-menstrual bleeding, oligo/amenorrhoes [18].

Pregnancy is a strain test for the thyroid, subsequent in hypothyroidism in women with limited thyroidal reserve or iodine scarcity [19]. Obvious hypothyroidism can arise in up to 2% pregnancies and subclinical hypothyroidism in up to 3% of pregnant women, hyperthyroidism can occur in up to 0.4% pregnancies [3]. During the first trimester, about 1 in 10 pregnant women develop antibodies to thyroid peroxidase (TPO) or to thyroglobulin, and hypothyroidism develops in roughly 16% of these women [19]. There are inadequate reports of prevalence of hypothyroidism during pregnancy from India with prevalence rates ranging from 4.8% to 11% [19].

Hyperthyroidism patients with severe forms of the disease usually present with a constellation of indications that may include lethargy, weight alterations, hair loss, dry skin, pomposity of the face, amnesia, change in bowel habits and depressions [11]. Graves' disease is the most common cause of hyperthyroidism in iodine-sufficient areas [20]. Toxic goiter, thyroiditis is also caused by hyperthyroidism [3]. Hyperthyroidism can exist with goitre, ophthalmopathy and signs of sympathetic nervous system hyper-activity [7]. Higher levels of free circulating thyroid hormones produce hyperglycemia by causing polyphagia, enhancing glucose absorption from the gastrointestinal tract, accelerating insulin degradation and stimulating glycogenolysis [17]. In turn, subclinical hyperthyroidism, characterized by serum TSH levels below lower limit of the reference range and normal serum FT4 levels, is observed in about 8% of individuals aged 65 years and older [12]. Further-more, subclinical hyperthyroidism is allied with increased risk of total, as well as coronary heart disease (CHD) mortality and atrial fibrillation incidents [12]. The highest risks of CHD mortality and atrial fibrillation are observed in the case of TSH levels lower than 0.1 mIU/l[12].

MATERIALS AND METHODS

Sample Collection

A total of 5400 cases (77 men and 447 non pregnant women) from the Zed Labs of Guntur, who attended the diagnostic centre in order to have their thyroid function tests done at Zed Labs were included in the study. This laboratory based descriptive study was carried out using data retrieved from the register maintained in wing of Biochemistry of Zed Labs.

Selection of Sample

The variables collected were age, sex, and thyroid function profile including free T3, free T4 and thyroid stimulating hormone (TSH). The estimation of serum free T3, free T4 and TSH were made by the Chemiluminescence immunoassay method, using fully automated Beckmann Coulter ACCESS Chemiluminescence's immune system.

Statistical analysis

In sample size calculation, for 95% confidence interval and, significance level α=5%, p=35%, allowable error =10%, required sample size was 524. P=percentage of thyroid disorder. The Chi-square test was used to observe the relationship between different variables and strength of the relationship with logistic regression. $P<0.005$ is considered as statistically significant.

RESULTS

Hypothyroidism is a common metabolic disorder in the general population particularly in women of higher age group, 9.5% of the participants of the Colorado prevalence study had elevated levels of thyroid stimulating hormone (TSH) [22]. Table 1 shows the distribution of thyroid dysfunction in the studied population. In our study the fraction of general thyroid disorder was 9.7%. The people were highly affected by subclinical hypothyroidism (5.5%) tracked by overt hypothyroidism (1.5%). The ratio of subclinical hyperthyroidism, clinical hypothyroidism, and clinical hyperthyroidism are 1.24%, 0.8% and 0.66% separately.

The frequency of hypothyroidism has been informed to be between 2% and 4% of the adult population in a report by Hollowell *et al* and in an Indian study a prevalence of 3.9% of hypothyroidism was reported by Usha Menon et al.[21]. In our study the prevalence of hypothyroidism is 7.8% and hyperthyroidism is 1.9%.

Table 1 Distribution of thyroid dysfunction

			95% CI	
Thyroid status	Frequency	Prercentage	Lower	upper
Euthyroidism	4876	90.3	89.4	91.2
Overt hypothyroidism	82	1.5	1.48	1.51
Subclinical hypothyroidism	295	5.5	5.42	5.58
Clinical hypothyroidism	44	0.8	0.76	0.83
Subclinicalhyperthyroidism	67	1.24	1.20	1.27
Clinicalhyperthyroidism	36	0.66	0.631	0.68
Total	5400	100		

Females are more vulnerable to hypothyroidism and subclinical hypothyroidism [23]. Table 2 displays the frequency, percentage distribution of thyroid dysfunction in females. Females were highly affected by subclinical hypothyroidism (6.2%), stalked by overt hypothyroidism,

subclinical hyperthyroidism (1.5%), clinical hypothyroidism and clinical hyperthyroidism are 1.5%, 1.3%, 0.98% and 0.79% respectively.

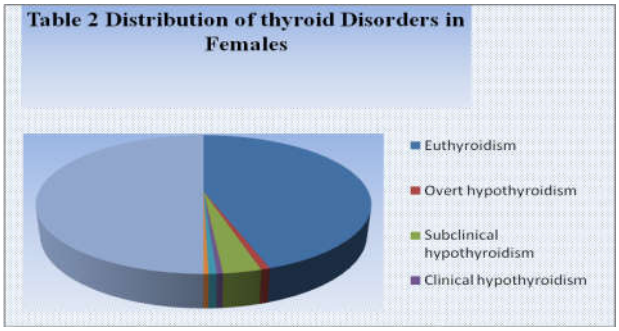

Table 2 Distribution of thyroid disorders in females

Hypothyroidism is ten times more common in women than men and its prevalence increases with age [23]. Table 3 shows the spreading of thyroid dysfunction in the considered population. Males were extremely affected by subclinical hypothyroidism (5.2%), trailed by overt hypothyroidism. Subclinical hyperthyroidism, clinical hypothyroidism and clinical hyperthyroidism are 1.81%, 0.41% and 0.41% respectively. Table two and three are showing that the subclinical hypothyroidism is predominant in both the genders and it is high in females compared to males. There was a relationship between gender and thyroid complaints (P=0.0970).

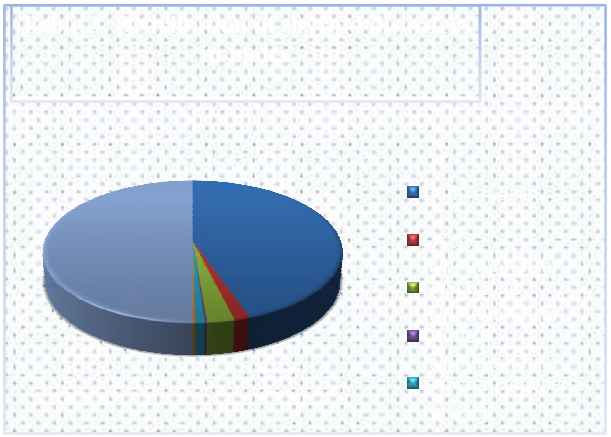

Table 3 Distribution of thyroid disorders in males

In a study, the occurrence of subclinical hypothyroidism in men over the age of 74 (16%) was nearly high as in women of the similar age (21%). Up to 75% of patients have only mildly elevated serum thyrotropin values, and 50% to 80% of patients have positive tests for anti thyroperoxidase antibody (TPOAb), depending on age, gender, and serum thyrotropin levels [24]. Table 4 displays the age distribution of thyroid dysfunction in the considered population. The majority of the study population belonged to the active age group 21-40 years tracked by 41- 60 years tailed by 41-60 years of age groups. The grade of thyroid dysfunction in 0-20 years of age group is overt hypothyroidism, subclinical hypothyroidism, clinical hypothyroidism, subclinical hyperthyroidism, clinical hyperthyroidism are 1.99%, 5.8%, 1.14% 0.4% and 0.28%. In this age group subclinical hypothyroidism is high (5.8%) and clinical hypothyroidism is low (0.28%).

The status of thyroid dysfunction in 21-40 years of age group is overt hypothyroidism, subclinical hypothyroidism, clinical hypothyroidism, subclinical hyperthyroidism, clinical hyperthyroidism are 1.75%, 5.5%, 0.98%,0.95% and 0.5%. In this age group also subclinical hypothyroidism is high (5.5%) and clinical hyperthyroidism is low (0.5%).

The status of thyroid dysfunction in 41- 60years of age group is overt hypothyroidism subclinical hypothyroidism, clinical hypothyroidism, subclinical hyperthyroidism, clinical hyperthyroidism are 0.89%, 5.3%, 0.5%, 2.1% and 0.89%. In this age group also subclinical hypothyroidism is high (5.3%) and clinical hyperthyroidism is low (0.89%).

The status of thyroid dysfunction in >60 years of age group is overt hypothyroidism, subclinical hypothyroidism and clinical hyperthyroidism are 1.39%, 5.2%, 1.4% and 1.7%. In this group also subclinical hypothyroidism is high (5.2%) and overt hypothyroidism is low (1.39%).

DISCUSSION

Thyroid disorders are due to abnormality in thyroid function and enlargement of the thyroid gland. Hyperthyroidism and hypothyroidism are common conditions that have lifelong effects on health [32, 33]. The present study showed thyroid disorders (9.7%) is high in the Guntur region.

Table 4 Distribution of thyroid disorders according to age

Age(years)	Euthyroidism	Overt [a]	S.C [a]	Clinical [a]	S.C [b]	Clinical b
0-20						
Frequency	634	14	41	8	3	2 (702)
Percentage	90.3	1.99	5.8	1.14	0.4	0.28
95% CI	(89.3, 91.2)	(1.2, 2.7)	(5.6, 5.9)	(1.0, 1.2)	(0.32,0.47)	(0.22,0.34)
21-40						
Frequency	2570	50	156	28	27	15 (2846)
Percentage	90.3	1.75	5.5	0.98	0.95	0.5
95% CI	(89.4, 91.2)	(1.66,1.83)	(5.4,5.59)	(0.93,1.02)	(0.9, 0.99)	(0.46,0.54)
41-60						
Frequency	1414	14	83	8	33	14 (1566)
Percentage	90.2	0.89	5.3	0.5	2.1	0.89
95% CI	(89.2,91.1)	(0.83,0.94)	(5.2,5.39)	(0.44,0.55)	(2.03,2.16)	(13.9,0.94)
>60						
Frequency	258	04	15	-	4	5 (286)
Percentage	90.2	1.39	5.2	-	1.4	1.7
95% CI	(89.27, 91.1)	1.27, 1.5	5.0, 5.36	-	1.28, 1.52	1.57, 1.8

Overt [a]: Overt hypothyroidism. S.C [a]: Subclinical hypothyroidism. Clinical [a]: Clinical hypothyroidism. S.C[b]: subclinical hyperthyroidism. Clinical[b]: subclinical hyperthyroidism.

The prevalence of total hypothyroidism is 80.3%, including overt hypothyroidism (15.6%), subclinical hypothyroidism (56.2%) and clinical hypothyroidism (8.3%).

In our study the whole hypothyroidism is 80.3%, including overt hypothyroidism (15.6%), subclinical hypothyroidism (56.29%) and clinical hypothyroidism (8.39%). Total hypothyroidism is 19.6, including subclinical hyperthyroidism 12.8% and clinical hyperthyroidism 6.9%. Subclinical hypothyroidism is high (49.2%) in females tracked by 7.0% in males. The subclinical hypothyroidism is high in males. This may be due to iodine deficiency and use of more alcohol by males in this region. Alcohol causes the thyroid gland not producing enough hormones [38].

This present study identified the status of thyroid disorder in population of Guntur region and can be used as a baseline data for further studies in future. The study reported that the prevalence of thyroid disorder typically subclinical hypothyroidism and overt hypothyroidism was higher. Further studies are required to characterize the reasons for this high prevalence. This study was laboratory based and because the study population constituted of subjects who came to the lab seeking thyroid function tests. The results may not be applicable to the general population.

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