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HOSPITAL BASED STUDY OF THYROID DISORDERS IN RURAL POPULATION OF GURGAON, HARYANA

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ABSTRACT

Introduction: Endocrine disorders pose a major threat to public health. Current research shows that 300 million people are suffering from thyroid disorders globally and 42 million among them reside in India.

Objective: Our objective is to find the prevalence of thyroid disorders in rural population of Gurgaon, Haryana.

Materials and Methods: This study was conducted in SGT Medical College & Hospital, Budhera, Gurgaon, Haryana from January, 2015 to July, 2016. 3940 patients were screened for thyroid function. Thyroid function was assessed by quantitative estimation of T_3 (Triiodothyronine), T_4 (Thyroxine) and TSH (Thyroid Stimulating Hormone) in serum by chemiluminscent immuno assay.

Results: The prevalence of thyroid disorder was found to be 25.17% (992) in the study population. 74.82% (2948) patients were euthyroid. Among the thyroid dysfunction patients 16.85% (665) belonged to hypothyroidism group (11.70% primary, 3.20% sub clinical and 3.24% clinically euthyroid) and 8.29% (327) to hyperthyroidism group (2.66% primary, 0.15% T_3 thyrotoxicosis, 0.58% sub clinical and 4.89% central)

Conclusion: The study findings call for a review of current practices in the management of thyroid disorders because of high prevalence of thyroid disorder in the reproductive age group (21-40). Thyroid disorders must be actively screened and monitored and to be effectively treated in diagnosed patients.

Key Words: Hypothyroidism, hyperthyroidism, thyroid dysfunction

INTRODUCTION

Endocrine disorders pose a major threat to public health. Thyroid dysfunction due to abnormal production of thyroid gland hormones (T_3-Triiodothyronine and T_4-Thyroxine) forms a major proportion of endocrine disorders after diabetes[1]. Thyroid hormones are metabolic hormones and are regulated by Thyroid Stimulating Hormone (TSH) secreted by pituitary gland.

Current research shows that 300 million people are suffering from thyroid disorders globally and 42 million among them reside in India[2]. Genetic and various environmental factors including geographical location, nutrition and diet especially iodine intake affect the prevalence of thyroid disorders. The utility of symptoms for screening of patients with thyroid disorders has become limited considering the recent trend of asymptomatic patients. Thyroid disorders are usually associated with additional morbidities: hypercholesterolemia, hypertension, infertility, adverse pregnancy outcomes and neuropsychiatry diseases, causing its under diagnosis. Even though there is no permanent cure, the patient can lead a normal life after diagnosis and treatment[3].

Despite the optimal iodine nutrition status of India classified by WHO in 2004, many parts of India are still iodine deficient[4, 5].

Paucity of data and the fact that Budhera and its surrounding region has iodine deficient status even in post iodization phase of India warrants for thyroid status surveillance of this region.

MATERIALS AND METHODS:

This study was conducted in the SGT Medical College, Bud-

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hera, Gurgaon, Haryana from January, 2015 to July, 2016. The study proposal was reviewed and approved by hospital ethical committee. A Total of 3940 outpatient department patients suspected of thyroid disorders were screened for thyroid function after obtaining consent from all the patients.

4 ml of fasting blood sample was collected and centrifuged for serum separation. Thyroid function was assessed by quantitative estimation of T_3, T_4 and TSH levels in serum performed using SEIMENS-Centaur CP analyzer based on chemiluminescent immuno assay (CLIA).

The subjects were categorized as euthyroid (normal TSH), hypothyroid (high TSH) and hyperthyroid (low TSH) based on serum thyroid hormone levels.

Normal thyroid hormone levels:

Triiodothyronine (T_3) (ng/ml) : 0.45-2.0
Thyroxine (T_4) (µg/ml) : 4.4-11.6
Thyroid Stimulating Hormone (TSH) (µIU/ml): 0.39-5.0

Further classification of hypothyroid and hyperthyroid patients was done using following definitions[6]:

S.No.	Type of thyroid disorder	Definition
A.	Hypothyroidism	High TSH (>5.0)
I.	Primary	Low T_3 &/or low T_4 with high TSH
II.	Sub-clinical	Normal T_3, T_4 with high TSH
III.	Clinically euthyroid	Normal/high T_3, high T_4 with high TSH
B.	Hyperthyroidism	Low TSH (<0.39)
I.	Primary	Normal/high T_3, high T_4 with low TSH
II.	T3 toxicosis	High T_3, normal T_4 with low TSH
III.	Sub clinical	Normal T_3, T_4 with low TSH
IV.	Central	High T_3 &/or high T_4 with normal TSH

STATISTICAL ANALYSIS

Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) version 24.0.The data were represented as counts, percentage and mean ± standard deviation. Comparison of thyroid hormone levels among different thyroid disorder groups was analyzed by one way analysis of variance (ANOVA). Chi test was used to assess the prevalence of thyroid disorders in different age groups and gender (Males vs Females).

RESULTS

3940 patients suspected of thyroid dysfunction visited Clinical Biochemistry Lab for thyroid hormone investigations from January, 2015 to July, 2016. The prevalence of thyroid disorder was found to be 25.17% (992) in the study population. 74.82% (2948) patients were euthyroid. Among the thyroid dysfunction patients 16.85% (665) belonged to hypothyroidism group and 8.29% (327) to hyperthyroidism group.

Hypothyroidism

In this study, out of 665, maximum number of patients 461(69.32%) were diagnosed with primary hypothyroidism followed by 128 (19.24%) with sub clinical hypothyroidism and 76(11.42%) with clinically euthyroid. A significant difference in the thyroid levels between these groups was found by one way ANOVA.

Out of 665, 547 (82.25%) were females and 117 (17.59%) were males. Chi test showed significant difference ($p<0.0001$) for association of the gender groups with hyperthyroidism.

Effect of age groups was also studied. 57% (389) of hypothyroidism patients fall in the age group of 21-40.Very few patients in the age group of 0-10 had hypothyroidism. A Significant difference was found with $P<0.0001$ for association of age group with hypothyroidism by chi test.

Hyperthyroidism

Out of 327, 193(59%) of patients belonged to central hyperthyroidsim group followed by 105(32.11%) in primary hyperthyroidism, 23(7.03%) in sub clinical hyperthyroidism and 6(1.83%) in T_3 thyrotoxicosis. One way ANOVA showed significant difference between the thyroid levels of these groups

In the hyperthyroidism study group, 278 (85.01%) were females and 49(14.98%) were males. Significant difference was found by chi test.

More than 60% of hyperthyroid patients were in the age group of 21-40 (199). The Least number of patients were in the age group of >61.A Significant difference was found with $P<0.0001$ for association of age groups with hyperthyroidism by chi test.

DISCUSSION

Thyroid disorders are amongst the most common endocrine diseases in India. The prevalence and pattern of thyroid disorders depend on sex, age, ethnicity, geographical factors

and nutrition especially on iodine intake. A high iodine intake is associated with lower prevalence of goitre and higher prevalence of hypothyroidism. Low intake is associated with a higher prevalence of hyperthyroidism [7]. Despite the coverage of National iodine deficiency control programmes (NIDDCP) in India, thyroid disorders are not confined to the conventional iodine deficient sub Himalayan zone but also extended to the plain fertile lands[8]. A possible etiological role of cyanogenic foods acting as goitrogens to interfere with iodine nutrition has been previously suggested [9, 10,11,12,13]. Increasing exposure to thyroid disruptors, including industrial and agricultural contaminants has been identified as a growing health concern throughout India.[14]

In the present study, out of 3940 patients suspected with thyroid disorder, highest number (74.82%) of subjects was found to be euthyroid. A hospital based study conducted by Rebecca et al also reported that about 80% of patients were found to be euthyroid [3, 13]. Among the thyroid dysfunction patients (25.17%), 16.8% were hypothyroid (11.7% primary, 3.2% sub clinical and 1.9 % clinically euthyroid) and the results were found to be in contrast with the findings of Rebecca et al.

The strikingly larger percentage of subjects with primary hypothyroidism in our study is most likely based on the subjects' high iodine and goitrogenic foods intake such as brassica, cabbage, cauliflower, fast food, chocolates, milk, eggs and other vitamin E rich compounds which stimulate iodine absorption. Most goitrogens are naturally occurring chemicals that are ingested in foods or drugs. These chemicals can interfere with thyroid function in different ways. Some goitrogenic compounds induce antibodies that cross-react with the thyroid gland, other interferes with thyroid peroxidase, the enzyme that organifies iodide to iodine and adds the iodine to tyrosine residues on thyroglobulin during the synthesis of thyroid hormones. Either way, thyroid is unable to produce as many of thyroid hormones as are needed to regulate metabolism [15].

Hyperthyroidism was seen in 8.2% (2.6% primary, 4.8% central, 0.58% sub clinical and 0.15% T3 thyrotoxicosis) and is comparable to many studies[12,16,17].The number of females was higher (n=825) indicating a high prevalence of thyroid dysfunction in women than men. This finding is supported by various studies [18, 19].

The thyroid disorder cases were classified into seven age groups to determine the occurrence of various thyroid disorders in different age groups. Various studies support the observation that maximum number of patients were seen in the age group of 21-30 years (33.3% hypothyroid and 39.7% hyperthyroid) followed by 31-40 age group (24.9% hypothyroid and 21.1 % hyperthyroid) [20].

Our findings show that the major burden of thyroid disorders is on reproductive age groups. If left untreated, hypothyroidism can cause elevated cholesterol levels, an increase in blood pressure, an increased rate of cardiovascular complications, decreased fertility, and depression; and in pregnant women, placental abnormalities and increased risks for the baby's well being. These symptoms are often confused with other disorders, thus making thyroid disorders one of the most under diagnosed disorders in India[21]. This indicates that thyroid diseases should be considered during routine evaluation of this susceptible group and should be followed by appropriate detection and treatment. This problem must be addressed immediately to avoid deleterious effects of abnormal thyroid dysfunction on the patients as well as on their offspring[11]. There is a need for further studies to evaluate the affect of environmental and etiological factors such as auto immunity, drugs, iodine and non thyroid illness on thyroid dysfunction in this area.

CONCLUSION

Based on our findings, we first believe that widespread routine screening is important to identify those individuals susceptible to or afflicted by thyroid disorders. This is especially important in that the signs and symptoms of thyroid dysfunction mimic those of many other common diseases.

Second, the study findings call for a review of current practices in the management of thyroid disorders because of high prevalence of thyroid disorder in the reproductive age group (21-40). Thyroid disorders must be actively screened and monitored and to be effectively treated in diagnosed patients.

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Table 1: Overall distribution of thyroid disorders (n=3940)

S.No	Thyroid status	Number	Percentage
1.	Euthyroid	2948	74.82%
2.	Hypothyroid	665	16.85%
	Primary	461	11.70%
	Sub clinical	128	3.24%
	Clinically euthyroid	76	1.92
3.	Hyperthyroidism	327	8.29%
	Primary	105	2.66%
	T_3 Thyrotoxicosis	6	0.15%
	Sub clinical	23	0.58%
	Central	193	4.89%

Table 2: Comparison of thyroid hormone levels among hypothyroidism groups

S.No	Thyroid hormones	Primary	Sub clinical	Clinically euthyroid	P-value
1.	T_3 (ng/ml)	0.60 ± 0.42	1.16 ± 0.35	1.59 ± 0.36	0.0001
2.	T_4 (µg/ml)	2.38 ± 1.48	8.24 ± 1.70	13.95 ± 2.33	0.0001
3.	TSH (µIU/ml)	88.42 ± 77.17	12.03 ± 11.24	9.38 ± 5.62	0.0001

Table 3: Comparison of thyroid hormone levels among hypothyroidism gender groups

S.No	Thyroid hormones	Male=117 (17.59%)	Female=547(82.25%)
1.	T_3 (ng/ml)	1.04 ± 0.48	1.11± 0.45
2.	T_4 (µg/ml)	7.53 ± 3.62	7.83 ± 3.67
3.	TSH (µIU/ml)	32.97± 60.33	25.31 ± 42.99

Table 4: Comparison of thyroid hormone levels among hypothyroidism age groups

S.No	Age groups (Years)	T_3 (ng/ml)	T_4 (µg/ml)	TSH (µIU/ml)	Number	Percentage
1.	0-10	1.45 ± 0.49	10.88 ± 3.10	16.86 ± 29.93	22	3.30
2.	11-20	1.19 ± 0.42	7.64 ± 3.80	21.50 ± 30.99	41	6.16
3.	21-30	1.12 ± 0.43	7.98 ± 7.43	26.98 ± 46.94	223	33.53
4.	31-40	1.11 ± 0.87	7.57 ± 3.67	31.91 ±56.09	166	24.96
5.	41-50	1.25 ± 0.17	7.23 ± 3.11	27.16 ± 47.21	123	18.49
6.	51-60	1.04 ± 0.46	6.91 ± 3.16	28.16 ± 49.37	48	7.21
7.	>61	0.93 ± 0.41	6.63 ± 2.98	22.66 ± 27.61	42	6.31

Table 5: Comparison of thyroid hormone levels among hyperthyroidism groups

S.No	Thyroid hormones	Primary	T_3 thyrotoxicosis	Sub clinical	Central	P-value
1.	T_3 (ng/ml)	2.91 ± 1.92	2.18 ± 0.27	1.30 ± 0.36	1.75 ± 0.51	0.0001
2.	T_4 (µg/ml)	18.31± 5.50	8.90 ± 1.57	9.13 ± 1.62	14.00 ± 2.55	0.0001
3.	TSH (µIU/ml)	0.17 ± 0.22	0.14 ± 0.16	0.11 ± 0.09	2.42 ± 1.30	0.0001

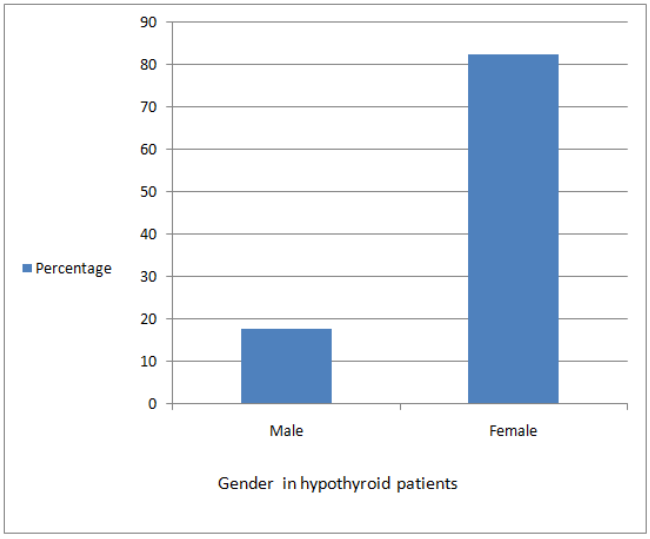
Table 6: Comparison of thyroid hormone levels among hyperthyroidism gender groups

S.No	Thyroid hormones	Male=49 (14.98%)	Female=278 (85.01%)
1.	T_3 (ng/ml)	2.57 ± 1.82	2.03 ± 1.22
2.	T_4 (µg/ml)	14.91± 4.81	14.97 ± 4.58
3.	*TSH (µIU/ml)	1.82 ± 1.80	1.45 ± 1.47

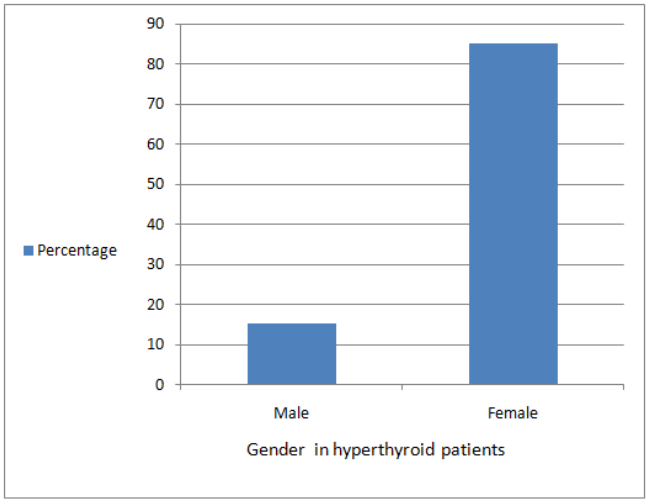
Table 7: Comparison of thyroid hormone levels among hyperthyroidism age groups.

S.No	Age groups (Years)	T_3 (ng/ml)	T_4 (µg/ml)	*TSH (µIU/ml)	Number	Percentage
1.	0-10	1.77 ± 0.43	13.39 ± 2.17	2.16 ± 1.51	25	7.64
2.	11-20	2.30 ± 1.22	15.88 ± 4.77	1.40 ± 1.40	30	9.17
3.	21-30	1.93 ± 0.87	14.29 ± 3.65	1.95 ± 1.62	130	39.75
4.	31-40	2.16 ± 1.40	15.50 ± 5.53	1.14 ± 1.53	69	21.10
5.	41-50	2.41 ± 1.93	15.74 ± 5.09	1.38 ± 1.74	37	11.31
6.	51-60	2.17 ± 1.59	14.97 ± 4.76	0.96 ± 1.25	24	7.33
7.	>61	1.99 ± 1.94	14.99 ± 5.44	1.85 ± 2.17	12	3.66

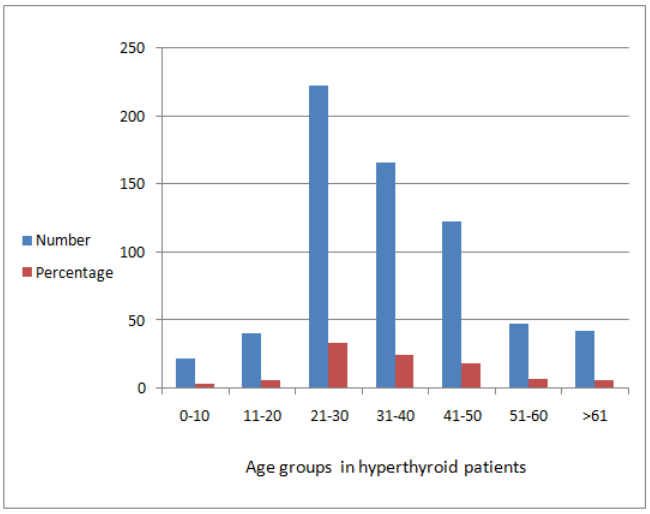
*The mean values of TSH is normal because of presence of fourth group i.e., central hyperthyroidism which has normal TSH levels with deranged T_3 and/or T_4 levels



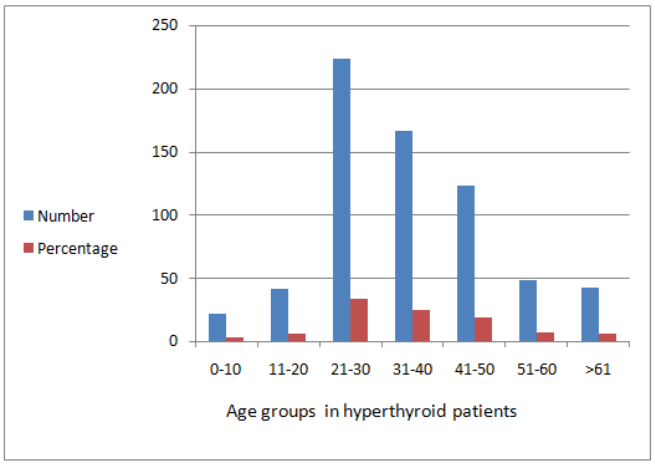
Graph 1: Percentage of males and females in hypothyroidism group.



Graph 3: Percentage of males and females in hyperthyroidism group.



Graph 2: Number and percentage of different age groups in hypothyroid patients.



Graph 4: Number and percentage of different age groups in hyperthyroid patients.