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Status of Circulating Markers of Thyroid Gland among the People of Indore city, India

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Abstract

Now a days thyroid related disease likes sub-clinical hypothyroidism, hypothyroidism and hyperthyroidism are the major problems of population mainly in elder women. Thyroid function test is used to evaluate the functions of thyroid gland and disease status. So the present study was aimed to estimate the levels of circulating markers of thyroid gland in sera and to interpret the results to know the prevalence and pattern of abnormal condition of thyroid in the people of Indore city. The parameters studied were T3, T4 and TSH. It was found that 10.76% (9.95% female and 0.81% male) populations was affected by sub-clinical hypothyroidism, 3.25% (2.55% female and 0.69% male) was affected by hypothyroidism, 3.25% (2.89% female and 0.35% male) by sub-clinical hyperthyroidism, 2.2% (1.27% female and 0.93% male) by primary hypothyroidism, 1.63% (1.39% female and 0.23% male) by primary hyperthyroidism and 1.39% (1.04% female and 0.35% male) was affected by hyperthyroidism. It was concluded from the present study that sub-clinical hypothyroidism was the most prevalent than other disorder of the thyroid gland in the people of Indore city and females were more affected than males by all forms of thyroid disease.

Keywords: Tri-iodothyronine (T3), Tetra-iodothyronine (Thyroxine T4), Thyroid Stimulating Hormone (TSH), Hypothyroidism (HPO), Hyperthyroidism (HPR), Indore city.

Introduction

Thyroid abnormalities affect a considerable portion of the population[1]. However, the prevalence and the pattern of thyroid disorders depend on ethnic and geographical factors and especially on iodine intake. Thyroid dysfunction is present in 2.3–3.8% in general[2], as well as during pregnancy[3]. However, nearly 10% of abnormal thyroid function was observed according to thyroid function survey using general health checkup system for the adult in Japan[4] and it was found that pregnant women in Japan have higher prevalence of thyroid dysfunction. The report suggested that thyroid hormone function, especially TSH level, may be associated with gender differences[5]. Hyper and hypothyroidisms are the disorders of thyroid gland. Thyroxines (T4), triodo thyronine (T3) are the two hormones produced and released by thyroid gland upon the release and stimulation of thyroid stimulating hormone (TSH) from pituitary gland. Hyperthyroidism called thyrotoxicosis is a clinical condition caused by the over production of thyroid hormones. Hypothyroidism is defined as a deficiency of thyroid activity caused by low production of thyroid hormones in the body. Occurrence of mild and severe forms, are observed in the population[6,7]. Women are affected more often than men and both sexes are affected more frequently with increasing age[8].

So the present study was aimed at observing prevalence and pattern of thyroid disease on the basis of gender in the population of Indore city, MP, India.

Material and Methods

Material: 864 cases were received in Central Lab-Oncquest Laboratories Ltd., Indore for thyroid function test in which 79.4% (686) was females and 20.6% (178) was males. The percentage of Total normal cases were 77.55% (670) in which 60.3% (521) was females and 17.25% (149) was males.

Circulating Markers for Thyroid Status: T3, T4 and TSH.

Instrument: Architect i 1000 SR Immunoassay system from Abbott Diagnostics.

Methods used in the study: Name of the method: Total T3, T4 and TSH Assay- the Architect Total T3, Total T4 and TSH assay is a chemiluminescent micro particle immunoassay (CMIA) for the quantitative determination of T3, T4 and TSH in human serum.

Results and Discussion

The percentage of total abnormal cases were 22.45% (194) in which 19.09% (165) was females and 3.36% (29) was males. Twenty eight samples (22 females and six males) received for T_3, T_4, and TSH were found to have Total T_3 and Total T_4 values below the biological reference ranges with TSH above the biological reference range. These result suggested hypothyroidism condition in the above patients as shown in the table-1 and 2. The normal value of TT_3, TT_4, and TSH for

females and males were 1.085±0.233 ng/ml, 8.468±1.849 µg/dl and 2.431±1.472 µIU/ml respectively. The values of TT_3, TT_4, and TSH for females having hypothyroidism were 0.539 ± 0.183 ng/ml, 2.487 ± 1.969 µg/dl and 73.082 ± 40.442 µIU/ml respectively and for males were 0.489±0.087ng/ml, 1.749 ± 0.829 µg/dl and 85.719±34.983µIU/ml respectively. The male patient samples had higher TSH than females though the number of male patient samples in this category was only six as compared to 22 female patient samples.

Table-1 and 2 shows twelve samples (nine females and three males) received for T_3, T_4, and TSH were found to have Total T_3 and Total T_4 values above the biological reference ranges with TSH below the biological reference range. This suggested hyperthyroidism in them. The values of TT_3, TT_4, and TSH for females were 3.207±1.628ng/ml, 16.215±2.476µg/dl and 0.024±0.026µIU/ml respectively and for males were 2.257±0.462ng/ml, 17.15±3.375µg/dl and 0.044±0.021µIU/ml respectively. The male patient samples had higher TSH than females though the number of male patient sample in this category was only three as compared to nine female patient samples.

Ninety three samples (86 female and seven male) received for T_3, T_4, and TSH were found to have Total T_3 and Total T_4 values within the biological reference range with TSH above biological reference range these result suggested sub-clinical hypothyroidism in them as shown in table-1 and 2. The values for females were 1.126±0.2ng/ml, 8.032±1.792µg/dl and 12.575±13.079µIU/ml respectively and for males were 1.146±0.203ng/ml, 8.528±1.884µg/dl and 14.19±16.853µIU/ml respectively. The male patient samples had higher TSH than females though the number of male patient sample in this category were only seven as compared to 86 female patient samples.

Twenty eight samples (25 female and three male) received for T_3, T_4, and TSH were found to have Total T_3 and Total T_4 values within biological reference range with TSH below biological reference range this suggested sub-clinical hyperthyroidism in them as shown in the table-1 and 2. The values for females were 1.125±0.236ng/ml, 9.11±1.980µg/dl and 0.122±0.085µIU/ml respectively and for males were 1.794±1.074ng/ml, 12.224±6.110µg/dl, and 0.05±0.070µIU/ml respectively. The male patient samples had lower TSH than females and also the number of male patient sample in this category was three as compared to 25 female patients.

Table-1 and 2 shows the fourteen samples (12 female and two male) received for T_3, T_4, and TSH were found to have total T_3 and TSH values within while total T_4 above the biological reference range these result suggested primary hyperthyroidism in them. The values for females were 1.214±0.264ng/ml, 12.396±0.622µg/dl and 2.23±1.23µIU/ml respectively and for males were 1.16±0.015ng/ml, 12.115±0.036µg/dl and 2.19±2.136µIU/ml respectively. The male patient samples had lower TSH than females and also the number of male patient sample in this category were only two as compared to 12 female patient samples.

Table-1 and 2 shows nineteen samples (11 female and eight male) received for T_3, T_4 and TSH were found to have Total T_3 within the biological reference range while Total T_4 below the biological reference range and TSH above the biological reference range this suggested primary hypothyroidism in them. The values for females were 0.995±0.226ng/ml, 4.608±0.905µg/dl, 26.485±21.226µIU/ml respectively and for males were 0.897±0.242ng/ml, 3.658±1.235µg/dl and 49.395±45.587 µIU/ml respectively. The male patient samples had higher TSH than females though the number of male patient sample in this category were only eight as compared to 11 female patient samples.

Table-1
Female (n) patients with different conditions of thyroid disease

S. No.	Clinical condition	Circulating markers for thyroid function		
		T3 (ng/ml)	**T4 (µg/dl)**	**TSH (µIU/ml)**
	Control female	1.085±0.233	8.468±1.849	2.431±1.472
1	Hypothyroidism (n=22)	0.539±0.183**	2.487±1.969**	73.082±40.442**
2	Hyperthyroidism (n=9)	3.207±1.628**	16.215±2.476**	0.024±0.026**
3	Sub-clinical hypothyroidism (n=86)	$1.126±0.2^{NS}$	$8.032±1.792^{NS}$	12.575±13.079**
4	Sub-clinical hyperthyroidism (n=25)	$1.125±0.236^{NS}$	$9.110±1.980^{NS}$	0.122±0.085**
5	Primary hyperthyroidism (n=12)	$1.214±0.264^{NS}$	12.396±0.622**	$2.23±1.23^{NS}$
6	Primary hypothyroidism (n=11)	$0.995±0.226^{NS}$	4.608±0.905**	26.485±21.226**

*= Values are Significant ($p<0.05$), **= Values are very significant ($p<0.01$) and ns= not significant ($p>0.05$).

Table-2
Male (n) patients with different conditions of thyroid disease

S. No.	Clinical condition	Circulating markers for thyroid function		
		T3 (ng/ml)	T4 (µg/dl)	TSH (µIU/ml)
	Control male	1.085±0.233	8.468±1.849	2.431±1.472
1	Hypothyroidism (n=6)	0.489±0.087**	1.749±0.829**	85.719±34.983**
2	Hyperthyroidism (n=3)	2.257±0.462**	17.15±3.375**	0.044±0.021**
3	Sub-clinical hypothyroidism (n=7)	1.146±0.203^{NS}	8.528±1.884^{NS}	14.19±16.853**
4	Sub-clinical hyperthyroidism (n=3)	1.794±1.074**	12.244±6.110**	0.05±0.070**
5	Primary hyperthyroidism (n=2)	1.16±0.015^{NS}	12.115±0.036**	2.19±2.136^{NS}
6	Primary hypothyroidism (n=8)	0.897±0.242*	3.658±1.235**	49.395±45.587**

*= Values are Significant ($p<0.05$), **= Values are very significant ($p<0.01$) and ns= not significant ($p>0.05$).

Table-3
Showing the percentage of normal and abnormal conditions of population of Indore city

Sr. No.	Clinical condition	% of female	% of male
	Normal	60.3	17.25
1	Hypothyroidism	2.55	0.69
2	Hyperthyroidism	1.04	0.35
3	Sub-clinical hypothyroidism	9.95	0.81
4	Sub-clinical hyperthyroidism	2.89	0.35
5	Primary hyperthyroidism	1.39	0.23
6	Primary hypothyroidism	1.27	0.93

Discussion: The present study showed that hypothyroidism was more common in females. There are studies which suggested that TSH level may be associated with gender differences[9]. TSH concentration is higher in women than in men[10]. A recent study suggested hypothyroidism was more prevalent than hyperthyroidism and most of cases were categorized as subclinical disease[11].

Present study showed that hyperthyroidism was common in females than in males. There are studies which suggested that the frequency of hyperthyroidism is higher in females than males and in patients who have thyrotoxicosis seems more likely to develop hyperthyroidism[12]. The prevalence's of hyperthyroidism were 4.65% in a study in Nepal. A similar study observed that nearly 30% of the populations were suffering from thyroid dysfunction in the eastern part of Nepal[13].

The present study showed that sub-clinical hypothyroidism was more common in females. Previous studies suggested that it is a common disease and frequency varies between countries. Subclinical hypothyroidism prevalence in England was determined to be 2.8% in males and 7.5% in females[14]. Ramprasad M. *et al*. suggested Thyroid disorders are common in pregnancy, and the most common disorder is subclinical hypothyroidism[15].

The present study showed that the sub-clinical hyperthyroidism was more common in females. There are studies which suggested that during aging, gender specific alterations in TSH and free thyroid hormone levels have been observed[5]. The prevalence of sub-clinical hyperthyroidism varies from 0.7%-6% depending on the region and the age of the patients with normal serum T_3, T4 concentration and low serum TSH may have a normal value for serum TSH[16]. A few Cross-sectional studies have shown that subclinical hyperthyroidism was associated with lower cognitive performance, although the number of participants with subclinical hyperthyroidism was relatively small[17, 18].

Present study showed that the female and male patients with primary hypothyroidism were in the different age group but primary hypothyroidism was common in females. Studies suggested Elevated TSH, despite a normal or low T_4, indicates inadequate hormone production[19].

Present study showed that the female and male patients with primary hyperthyroidism were in the different age group but primary hyperthyroidism was more common in females. Studies suggested that aging results decrease in serum TSH and T_3 levels, whereas serum FT_4 levels remain unchanged. The common confounders for the determination of thyroid status in the elderly are nutritional status, illness, and medicines[20]. A study has reported that serum concentrations of free T_4 remains unchanged whereas free T_3 and TSH levels are found to be lower in older subjects[21].

Conclusion

From the present study it was concluded that sub-clinical hypothyroidism is more prevalent in Indore city and females are more susceptible to this disorder as compared to males.

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