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Original Research Article

Comparison of Thyroglobulin Levels among Different Ages, Gender, and Grades of Goiter in Patients with Simple Diffuse Goiter

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Abstract: ***Background:*** Simple diffuse goiter (SDG) which is also known as endemic goiter usually occurs in a large number of certain populations. Serum thyroglobulin (TG) is a thyroid-specific glycoprotein, that serves as the source for thyroxine (T4) as well as triiodothyronine (T3) production within the lumen of thyroid follicles. Serum thyroglobulin and urinary iodine concentration are considered the most potent indicators of iodine status and thyroid functions as thyroid volume, thyroid nodularity, or iodine excretion have close associations to serum TG. ***Aim of the study:*** The aim of the study was to observe the association of serum thyroglobulin with different ages, gender, and grades of goiter in patients with simple diffuse goiter. ***Methods:*** This single-center observational study was conducted at the Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka Bangladesh during the period from May 2014 to March 2016. The targeted sample size of this study was between 39 and 90 and the final sample size was determined as 87. A purposive sampling technique was used to select 87 patients with simple diffuse goiter attending the outpatient department of the study hospital. All data were processed, analyzed, and disseminated by using MS Office and SPSS programs as per necessity. ***Results:*** The lowest level of serum thyroglobulin (ng/mL) was found in the age group of 12-16 years (6.0±4.5 ng/mL) where the mean (±SD) age was 23.97±6.83 years. The mean (±SD) S. TG (ng/mL) levels in the male and female patients were 5.76 ± 5.72 and 11.60 ± 13.50 respectively. The mean (±SD) S. TG (ng/mL) levels among the grade I and II patients were 6.79±4.33 and 11.67±13.69 respectively. Overall, S. TG had no significant correlations with various factors like age gender, and goiter grades. According to the Pearson's or Spearman analysis in assessing the correlations, with serum thyroglobulin levels, the P values were found 0.813, 0.294, and 0.319 against age, gender, and goiter grades. ***Conclusion:*** Serum thyroglobulin has not any statistically significant correlation with age, gender, or grades of goiter in patients with simple diffuse goiter.

Keywords: Age, Gender, Thyroid, Thyroglobulin, Diffuse goiter.

I. INTRODUCTION

Serum thyroglobulin (TG) is a thyroid-specific glycoprotein, that serves as the source for thyroxine (T4) as well as triiodothyronine (T3) production within the lumen of thyroid follicles. Serum thyroglobulin and urinary iodine

concentration are considered the most potent indicators of iodine status and thyroid functions because thyroid volume, thyroid nodularity, or iodine excretion have close associations to serum TG. The thyroid gland is a minute organ near the front side of the neck that wraps around the windpipe. It is like a butterfly, with two large wings that stretch around the side of your throat. Thyroglobulin is a glycoprotein produced by the thyroid gland's follicular cells. It is used by the thyroid gland in the production of T3 and T4. In a healthy patient, the typical range for thyroglobulin is 3 to 40 nanograms per milliliter [1]. Serum thyroglobulin can also suggest goiter among patients. Enlargement of the thyroid gland is termed goiter. It is generally caused by iodine deficiency, which can also cause various other ailments. Goiter may be classified into toxic or nontoxic according to the patient's clinical status, diffuse or nodular according to its anatomic nature, and endemic or sporadic epidemiologically. Diffuse enlargement of the thyroid gland in the absence of nodules and hyperthyroidism is referred to as simple goiter [2]. Simple diffuse goiter (SDG) is common and appears endemically in areas usually because of low iodine intake [3], hence also named endemic goiter. Iodine is an essential component of thyroid hormones, which participate in the normal mental and physical development and maintenances of homeostasis in humans [4]. Goiter can be a result of iodine deficiency, and thyroglobulin (TG) may be a promising functional biomarker of both iodine deficiency and excess [5]. The serum TG concentrations primarily reflect three factors: (a) the mass of differentiated thyroid tissue present; (b) any physical damage to or inflammation of the thyroid gland and (c) the magnitude of thyrotropin receptor stimulation [6]. Changes in serum TG levels have been associated with a number of thyroid disorders including Graves' disease [7], subacute thyroiditis [7, 8] and thyrotoxicosis factitial [9]. Few studies to date have addressed the epidemiology of serum TG in a large population-based sample [3, 10]. Most observational studies have focused on small groups of patients with thyroid disease [7, 9, 10] with comparison and interpretation of results complicated by varying degrees of assay sensitivity, precision, or standardization [11-14].

II. OBJECTIVE

The general objective of this study was to observe the association of serum thyroglobulin with different ages, gender, and grades of goiter in patients with simple diffuse goiter.

III. METHODS AND MATERIALS

This single-center analytical study was conducted at the Department of Endocrinology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka Bangladesh during the period from May 2014 to March 2016. The targeted sample size of this study was between 39 and 90 and the final sample size was determined as 87. A purposive sampling technique was used to select 87 patients with simple diffuse goiter attending the outpatient department of the study hospital. Subject selection was done by consecutive purposive non-probability sampling as per inclusion and exclusion criteria. All the patient's written informed consent was taken. Ethical approval was from the Institutional Review Board of the concerned hospital.

Inclusion Criteria

- Subjects who had diffusely enlarged thyroid gland and clinically, biochemically in the euthyroid state.
- Age group 12-35 years.

Exclusion Criteria

- Patients with suspected differentiated thyroid cancer.
- Patients with acute and chronic illness.
- Pregnant and lactating mothers.
- Patient taking drug interfering in thyroid function test.
- Patients with Thyroiditis or Graves' disease.
- Patients with unilateral goiter.
- Patients with nodular goiter.

A blood sample (5 ml) was collected from each of the patients by the researcher himself and after the separation of serums, it was sent to the laboratory of NINMAS of BSMMU without delay for analysis of serum thyroglobulin. All data were processed, analyzed, and disseminated by using MS Office and SPSS programs as per necessity.

IV. RESULTS

In the present study, among a total of 87 participants, the majority were from the 17-21 years group which was 33.3%. Besides this, 12.6%, 16.1%, 18.4% and 19.5% participants were from 12-16, 22-26, 27-31 and >31 years' age groups respectively. The mean (±SD) age of the participants was 23.97 ± 6.83 years. Among the participants, 69% were male and the rest 31% were female. The male-female ratio was 2.2:1. The lowest level of serum thyroglobulin (ng/mL) was found in the age group of 12-16 years (6.0±4.5 ng/mL). Besides this, the thyroglobulin (ng/mL) was found 12.9±18.0, 12.8 ± 12.2, 12.9±11.4 and 8.8 ± 8.1 in 17-21(n=29), 22-

26(n=14), 27-31(n=16) and >31(n=17) years' age groups. In these, comparison the 'F' and 'P' values were found 0.813 and 0.52 respectively. The mean (±SD) serum thyroglobulin (ng/mL) level among the male population was 5.76±5.72 and among the female population, it was 11.60 ± 13.50. But there was not any statistical significance between the levels where the P-value was found 0.294. The mean (±SD) serum thyroglobulin (ng/mL) level among the grade I patients was 6.79 ± 4.33 and among the grade I patients it was 11.67 ± 13.69. But there was not any statistical significance between the levels where the P-value was found 0.319. Overall, serum thyroglobulin had no significant association with various factors like age gender, and goiter grades. According to the Pearson's or Spearman analysis in assessing the correlations, with serum thyroglobulin levels, the P values were found 0.813, 0.294, and 0.319 against age, gender, and goiter grades.

Table 1: Age distribution of the participants (N=87)

Age (years)	n	%
12-16 yrs.	11	12.6%
17-21 yrs.	29	33.3%
22-26 yrs.	14	16.2%
27-31 yrs.	16	18.4%
>31yrs.	17	19.5%
Mean ±SD	23.97 ± 6.83	

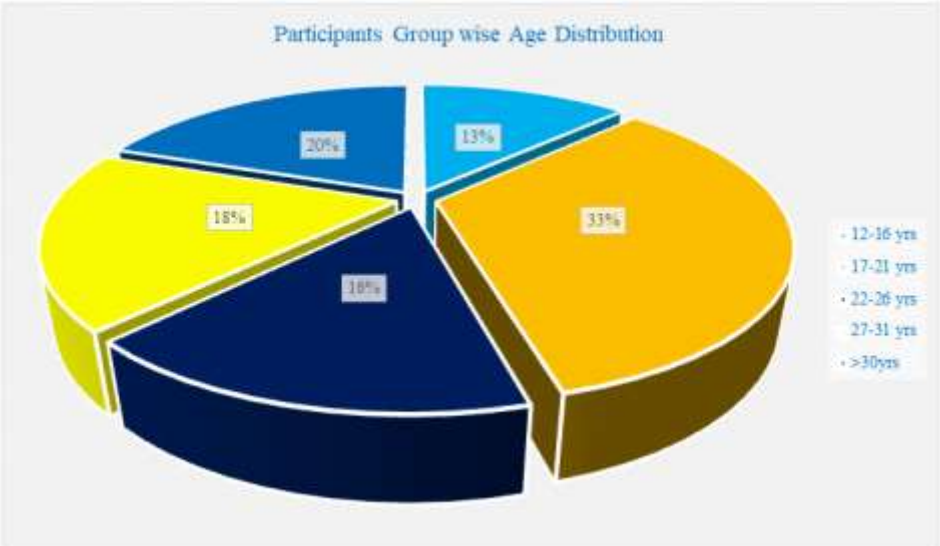

Figure I: Age Group-wise distribution of participants (N=87)

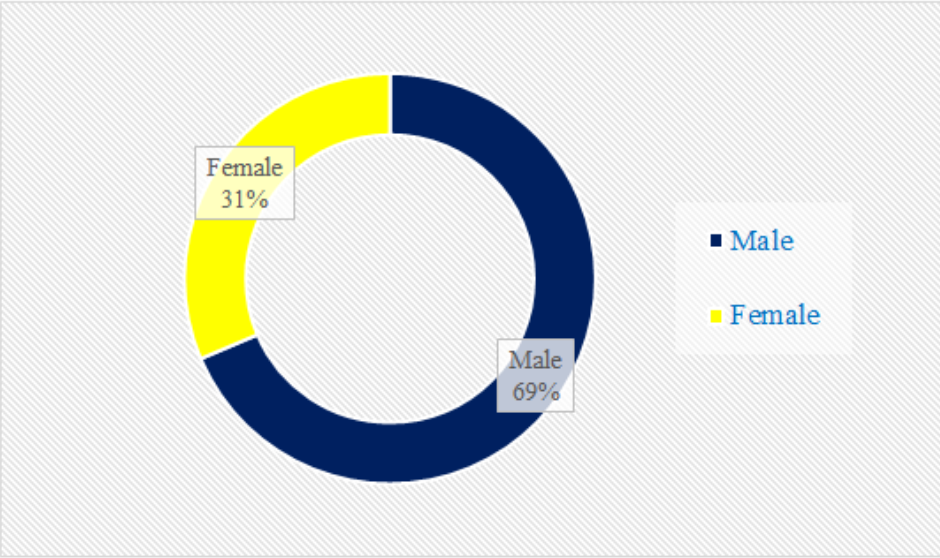

Figure II: Gender distribution of participants (N=87)

Table 2: Serum Thyroglobulin (ng/mL) levels in different age groups (N=87)

Age (Years)	S. Thyroglobulin (ng/mL) Mean ± SEM (CI)	Median
12-16 (n=11)	6.0 ± 4.5 (2.98-9.03)	5.16
17-21 (n=29)	12.9 ± 18.0 (6.10-19.87)	9.42
22-26 (n=14)	12.8 ± 12.2 (5.70-19.89)	10.63
27-31 (n=16)	12.9 ± 11.4 (6.82-19.01)	9.79
>31 (n=17)	8.8 ± 8.1 (4.60-13.00)	6.16
F	0.813	
p	0.52	

One-way ANOVA Test

Table 3: Serum Thyroglobulin (ng/mL) levels in different gender groups (N=87)

S. TG (ng/ml)	Male (n=6)	Female (n=81)	P-Value
Mean ±SD	5.76 ± 5.72	11.60 ± 13.50	0.294
Median	3.47	8.9	

Table 4: Serum Thyroglobulin (ng/ml) levels in different grades of goiter (N=87)

S. TG (ng/ml)	Grade I (n=8)	Grade II (n=79)	P-Value
Mean ±SD	6.79 ± 4.33	11.67 ± 13.69	0.319
Median	6.74	8.02	

Table 5: Correlations of serum thyroglobulin levels with age, gender, and grades of goiter (N=87)

Variables	P-value
Serum Thyroglobulin vs. Age	0.813
Serum Thyroglobulin vs. gender	0.294
Serum Thyroglobulin vs. goiter grade	0.319

V. DISCUSSION

The aim of the study was to observe the association of serum thyroglobulin with different ages, gender, and grades of goiter in patients with simple diffuse goiter. As shown by different studies, thyroglobulin levels increased in both lower and greater urinary iodine concentrations than in those with appropriate iodine status [6, 15]. We did not find any statistically significant differences in mean thyroglobulin concentrations among age groups, which was similar to the findings of another study [16]. Though thyroglobulin levels exerted relatively higher mean and median values in the age groups within 17-31 years (mean value around 13 ng/ml, median value around 10 ng/ml). On the other hand, subgroups with ages <17 years and >31 years showed lower mean and median values. Therefore, it is pertinent to assume that the age of the participants is unlikely to influence the pattern of thyroglobulin observed in subgroups of urinary iodine status as described above. Serum thyroglobulin level was found to be higher in the females in regards to both the mean and median values. Neither thyroglobulin nor urinary iodine was statistically different between the grade-1 and grade-2 goiter groups. Serum thyroglobulin can be elevated due to large thyroid mass, thyroid inflammation, or when TSH stimulates the thyroid. The generally increased thyroid mass found under iodine-deficient conditions most likely explains part of the elevation of serum thyroglobulin. However, thyroid volume alone does not explain the elevation of serum thyroglobulin found in iodine-deficient regions; elevated thyroglobulin is also found among subjects without goiter living in iodine-deficient areas [17]. Also, serum thyroglobulin has been demonstrated to be associated with various measures of iodine intake [18]. This suggests thyroglobulin be associated with the iodine nutrition status in the population, independently of the association with thyroid volume. Serum thyroglobulin shows only a little day-to-day variation [17]. Thyroglobulin was also found to be lower in grade-1 than grade-2 goiter, supporting an inverse relationship between thyroglobulin and urinary iodine as postulated by some authorities. It also reflects in another way that the larger the goiter increased is the level of thyroglobulin as observed by some other authorities [19]. But besides age in this study, we did not find any significant correlations with other two factors like gender and goiter grades. According to the Pearson's or Spearman analysis in assessing the correlations, with serum thyroglobulin levels, the P values were found 0.294 and 0.319 against gender and goiter grades.

Limitations of the Study

Though the study was conducted in a single hospital with small sample size, so the results may not represent the whole community.

Funding: No funding sources.

Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

VI. CONCLUSION

Serum thyroglobulin has not any statistically significant correlation with age, gender, or grades of goiter in patients with simple diffuse goiter. For getting more reliable information regarding these issues we would like to recommend conducting similar studies in several places with larger-sized samples.

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