# Sonographic Echo-pattern of the Thyroid Gland among the Non-nodular Goitrous Patients Having Abnormal thyrotropin Level at their First Diagnosis

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## ABSTRACT

**Objective:**

This study was done to observe the high resolution sonographic echo-pattern of the thyroid gland among the non-nodular goitrous patients having abnormal thyrotropin (TSH) level at their first diagnosis.

*Method:* This study was conducted at the Institute of Nuclear medicine and Allied Sciences, Rajshahi, Bangladesh during the period between 1st January, 2014 and 31st March, 2015. The goitrous patients are referred at this Institute by the clinicians for radionuclide thyroid scan, HRUS of thyroid gland and thyroid function tests. Under the basis of convenient sampling technique, 62 patients are included as sample. Their age, gender, HRUS echo-patterns of goiter and thyrotropin levels are recorded and analyzed with statistical software IBM SPSS v. 16.

*Results:* Among the total enrolled patients (n=62), 57 (91.9 %) were female and five (8.1 %) were male. Mean (± SD) age was 28 ± 11.85 years (range=8 to 69 years). Regarding thyrotropin level among the sample patients (n=62), 53 (85.5 %) had above normal range and 9 (14.5 %) had below normal range. In relation to sonographic echo-pattern of the non-nodular goitrous patients (n=62), 43 (69.4 %) had hypoechoic feature, 15 (24.2 %) had non-homogenous feature and four (6.5 %) had both hypoechoic and non-homogenous feature. Among the 43 goitrous patients with hypoechoic feature, 38 had thyrotropin above normal range and five had below normal range; among the 15 goitrous patients with non-homogenous feature, 12 had thyrotropin above normal range and three had below normal range and among the four goitrous patients with both hypoechoic and non-homogenous feature, three had thyrotropin above normal range and one had below normal range.

*Conclusion:* The results of this study will be helpful in the relevant prospective studies which will be concerned with developing non-nodular goiter management algorithm, in addition to the role of other parameters like thyroid function tests especially thyrotropin level, circulating thyroid auto-antibodies detection and fine needle aspiration biopsy (FNAB) cytology findings.

*Key words:* Sonographic echo-pattern, Non-nodular goiter, Thyrotropin level.

*Abbreviations:* HRUS=High resolution ultrasound, TSH=Thyroid stimulating hormone.

## INTRODUCTION

Over the last decades, due to the widespread availability, low financial cost, non-invasivity and a zero-radiation load, ultrasound is used as the leading medical imaging modality for the initial diagnostic work-up of various multi-organ medical disorders including thyroid pathologies. And its basic display mode is the brightness mode (B-mode) which reflects the various echogenicity of the study organs and areas.

Thyroid disorders are the most common reported endocrine disorders, after diabetes, which affect three to ten percent of adults with approximately five to eight times higher incidence in women than men (1,2,3). Among these thyroid disorders, auto-immune mediated thyroid inflammatory conditions are the most common sub-types. For example, chronic lymphocytic thyroiditis (which is also termed as Hashimoto's thyroiditis) is the most common auto-immune thyroid disorder (with a prevalence of 1 to 1.5 in 1000 overall populations & mostly observed in women between 30 and 60 years of age), frequently gives rise to non-nodular goiter with a variety of sonographic echogenicity, hypothyroidism or both

(4,5). Other common examples include subacute granulomatous thyroiditis (which is also termed as DeQuervains's thyroiditis, a painful non-nodular goitrous condition) and subacute lymphocytic thyroiditis (which is also termed as silent thyroiditis, as it is a painless, commonly occurs within one year after delivery and also a non-nodular goitrous condition). Another example is Graves' disease which is also a non-nodular goitrous condition and gives rise to hyperthyroidism. These auto-immune thyroid diseases commonly give rise to the circulating thyroid auto-antibodies, namely anti-thyroid peroxidase, anti-thyroglobulin and anti-thyroid stimulating receptor antibody. Although a few percent of these patients may have none of these circulating auto-antibodies present in their serum and few percent of the population may have these antibodies without developing those auto-immune thyroid disorders.

Regarding the current study's rationale, several relevant past studies show that sonographic various echo-patterns in non-nodular goitrous patients not only indicate a substantial link with both the circulating thyroid auto-antibodies and thyrotropin hormone levels, but also represent an important role in predicting the evolution of those auto-immune thyroid disorders at a very early stage(6,7,8,9). In addition, sonographic hypoechoic or non-homogenous echo-pattern findings may precede serum anti-thyroid peroxidase antibody positivity in Hashimoto's thyroiditis and > 20% of those patients may even remain sero-negative (10,11).

This study was conducted at the Institute of Nuclear medicine and Allied Sciences, Rajshahi, Bangladesh. The study period was between 1st January, 2014 and 31st March, 2015.

The non-nodular goitrous patients who were referred at this Institute by the clinicians for radionuclide thyroid scan, HRUS of thyroid gland and thyroid function tests. Among the referred patients, 62 patients are included as the sample under the basis of

convenient sampling technique. Patients age, gender, high resolution sonographic echo-pattern of the non-nodular goiter (using Siemens' SONOLINE G60 S Ultrasound Imaging System L10-5 MHZ transducer) and serum thyrotropin levels (using immuno-radiometric assay) which are recorded and later, analyzed with statistical software IBM SPSS v. 16.

## RESULT

Among the total enrolled patients (n=62), 57 (91.9 %) were female and five (8.1 %) were male.(Figure 1)
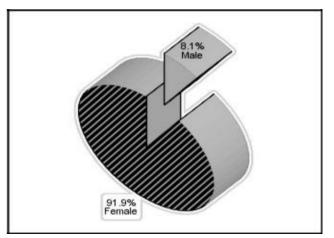


**Figure1: Gender disrtribution (inpercent among the mon-nodular goitrous patients**

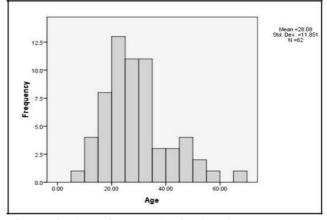Mean (± SD) age was 28 ± 11.85 years (range=8 to 69 years). (Figure 2)



**Figure 2: Age (in years) distribution among the non-nodular goitrous patients (n=62).**

Regarding thyrotropin level among the sample patients (n=62), 53 (85.5 %) had above normal range and 9 (14.5 %) had below normal range. (Figure 3)
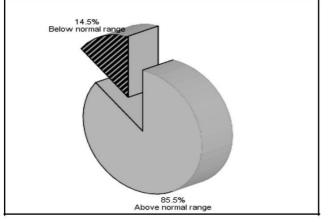
**Figure 3: Thyrotropin level (in percent) among the non-nodular goitrous patients (n=62)**

In relation to sonographic echo-pattern of the non-nodular goiter among the sample patients (n=62), 43 (69.4 %) had hypoechoic feature, 15 (24.2 %) had non-homogenous feature and four (6.5 %) had both hypoechoic and non-homogenous feature. (Figure 4)
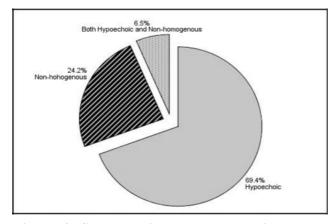


**Figure 4: Sonographic echo-patterns (in percent among the non-nodular goitrous patients (n=62)**

Among the 43 goitrous patients with hypoechoic feature, 38 had thyrotropin level above normal range and five had below normal range; among the 15 goitrous patients with non-homogenous feature, 12 had thyrotropin above normal range and three had below normal range and among the four goitrous patients with both hypoechoic and non-homogenous feature, three had thyrotropin above normal range and one had below normal range. (Figure 5)
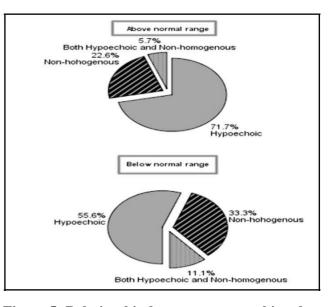


**Figure 5: Relationship between sonographic echo-patterns and thyrotropin level anong the non-nodular goitrous patients (n=62)**

**DISCUSSION**

Depending on the speed of thyroid cell damage, these auto-immune thyroid disorders related patients may attend the clinicians with initial hyperthyroidism (if thyroid cell damage is rapid). However, those patients attain euthyroid state, when the auto-immune mediated inflammation becomes mild either spontaneously or with treatment. And about 85%-90% percent patients with subacute thyroiditis patients recover spontaneously from abnormal thyrotropin level and goitrous condition within maximum period of one year from the onset, while Hashimoto's thyroiditis and Graves' disease patients remain persistent with hypothyroidism and hyperthyroidism respectively, if left untreated and thus result life-long conditions (12, 13).

Moreover, undiagnosed and subclinical auto-immune thyroid diseases commonly result different cardiac problems, osteoporosis, reproduction and body weight related disorders as well as a variety of psychological conditions. And as they are commonly associated with other auto-immune diseases, the

diagnostic work-out at the very early stage is incredibly crucial for the better management of those patients including the pregnant groups and thus preventing as well as limiting the complications and thereby ensuring the quality of life.

So, likewise the existing and established nodular goiter based thyroid disease management algorithm, similar approach is recommended for the development of non-nodular goiter based thyroid disease management algorithm by taking into account of the sonographic echo-pattern (including the color Doppler characteristics) of those above-mentioned and other relevant diseases, their radionuclide scan & uptake methods, thyroid function tests especially thyrotropin level, circulating thyroid auto-antibodies detection and fine needle aspiration biopsy (FNAB) findings.

## CONCLUSION

The results of this study will be helpful in the relevant prospective studies which will be concerned with developing non-nodular goiter management algorithm, in addition to the role of other parameters like thyroid function tests especially thyrotropin level, circulating thyroid auto-antibodies detection and fine needle aspiration biopsy (FNAB) findings.

### Acknowledgement-

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