

## THE INCIDENCE OF NODULE IN PATIENTS WITH GOITER

**ERKAN IBIS\***  
**RADIFE AKCURA\***  
**GÜNER ERBAY\***  
**GÜLSEREN ARAS\***  
**HULUSI OZKAYA\***  
**ASIM AKIN\***

*SUMMARY: A total of 4842 patients with goiter were studied by scintigraphic and ultrasonographic examination. We observed 2815 (58.1 %) nodular goiter and 2027 (41.9 %) diffuse goiter in total number of these cases. It was observed that the incidence of nodular goiter increased by increasing of age in both sexes while the reverse finding for diffuse goiter. The study suggests that higher incidence of nodular goiter in Turkey than hitherto appreciated and we are led to believe that this kind of goiter is one of the major health issues in Turkey.*

*Key Words: Nodular goiter, diffuse goiter, scintigraphy, ultrasonography.*

### INTRODUCTION

Goiter, a major manifestation of iodine deficiency, is a world-wide problem (1-6). Even though iodine-enriched salt is frequently used, incidence of goiter still remains as an important health issue in Turkey (4, 6-11).

The diffuse or nodular nature of goiter can be diagnosed by physical examination, as well as by using scintigraphy and ultrasonography (2,12-16). The differential diagnosis is important because of the possibility of malignancy in nodular goiter, in addition to the dependency of the treatment method on the functions of the nodules (17,18,19).

This study was aimed on the scintigraphic and ultrasonographic examination of nodular goiter incidence.

### MATERIALS AND METHODS

Scintigraphic and ultrasonographic examinations were performed on a total of 4842 patients who was referred in 1988 to Ankara University Medical School, Department of Nuclear Medicine. The ages of patients varied from 2 to 74, and 3928 (81.1%) were women.

Scintigraphic examination involved the intra-venous injection of 2 mCi of Tc-99m pertechnetate, followed in 15 minutes by 150 K of counting at the neck area, using a pinhole detector and a Siemens Searle camera, with the patient in a supine position. Then, the patients were examined ultrasonographically, using a Toshiba 32B instrument with a 5 MHz linear transducer. Sonographic pillow was used to increase the resolution. The two examinations were sufficient to determine the type of goiter in the patients.

We separated our sample into four age groups: below 15, 15-30, 31-45, and those above the age of 45. The prevalence of diffuse and nodular goiter was studied for both sexes in those age groups.

### RESULTS

The smallest nodule sizes detected during the examinations were 7 mm by scintigraphy and 3 mm by ultrasonography.

There were 2815 (58.1 %) nodular and 2027 (41.9%) diffuse goiter cases among the sample examined. We determined the overall female/male ratio of goiter sufferers to be 4.3. Of the population with nodular goiter, 2270 (80.6%) were female and 545 (19.4 %) were male, with a female/male ratio of 4.2. As regards the population with diffuse goiter, 1658 (81.8%) were female, and 364 (18.2%)

\*From Department of Nuclear Medicine, Medical School, Ankara University, Ankara, Turkiye.

Table 1: Distribution of nodular and diffuse goiter cases among female and male patients.

Sex	Nodular goiter	Diffuse goiter	Total
Female	2270 (57.8%)	1658 (42.2%)	3928
Male	545 (59.6%)	369 (40.4%)	914
Total	2815 (58.1%)	2027 (41.9%)	4842

were male, with a female/male ratio of 4.5. Among the 3928 female patients examined, 2270 (57.8%) had nodular and 1658 (42.2%) had diffuse goiter. Concerning the 914 males, 545 (59.6%) had nodular and 369 (40.4%) had diffuse goiter. Table 1 displays the results in that regard.

So far as the distribution among age groups is concerned, 190 (3.9%) were below the age of 15, 1870 (38.6%) were in the 15-30 age group, 1644 (34.0%) were in the 31-45 age group, and 1138 (23.5%) were above 45 years of age. In the age groups, there were rather wide variations in the number of patients with nodular and diffuse types of goiter. Among those below 15 years of age, 22.1% had nodular and 77.9% had diffuse goiter, while in the 15-30 age group, 37.5% suffered from nodular goiter and 62.5% from diffuse goiter. A reversal in the percentages was observed with the higher age groups; in the 31-45 group, 67.7% had nodular while 32.3% had diffuse goiter, and among the patients older than 45, nodular goiter frequency went up to 84.3% while diffuse goiter was relatively low 15.7%. Consequently, the variation of the nodular/diffuse ratio among the age groups is as follows: 0.3 for those younger than 15, 0.6 for the 15-30 age group, 2.1 for the 31-45 age group and 5.4 for those older than 45 (Table 2).

Going further with the analysis, the percentages of females and males in each age group were determined for nodular and diffuse goiter types. In the age group younger than 15, 18.9% were females with nodular goiter (FNG), 56.8% were females with diffuse goiter (FDG),

3.2% were males with nodular goiter (MNG), and 21.1 % were males with diffuse goiter (MDG). In the 15-30 group, the distribution was 32.4% FNG, 51.5% FDG, 5.1% MNG, and 11.0%MDG. For the 31-45 age group, the figures are: 59.9% FNG, 26.7% FDG, 13.8% MNG, 5.6% MDG. Among the patients older than 45, the respective percentages are 65.3% FNG, 13.0% FDG, 19.0% MNG, and 2.7% MDG (Table 3).

Scanning through the admission records of the patients, it was determined that the majority were from Central, Eastern, South-eastern Anatolia, Black Sea and Mediterranean regions. It was observed that 2824 (58.3%) cases were from the Central Anatolia, Eastern Anatolia and Black Sea regions, well recognized as Turkey's endemic goiter areas (2,4,5,11).

DISCUSSION

Goiter has been sufficiently investigated in many of its manifestation, world-wide. Williams determined that goiter is 7 to 9 times more common in women than in men (20). The prevalence of goiter in women has been supported in the studies done in Turkey (4,10, 11, 21, 22). However, the female/male ratio varies among the researchers: 4.5 was reported by Kologlu, *et al.* (4); 3.2 by Urgancioglu, *et al.* (11); 4.0 by Karpuzoglu, *et al.* (21); 5.2 by Yilmaz, *et al.* (22). Our result of 4.3 is within the above range of values.

Table 3: Percentage of goiter incidence in female and male patients.

Age groups (year)	FEMALE		MALE	
	Nodular	Diffuse	Nodular	Diffuse
< 15	18.9%	56.8%	3.2%	21.1%
15- 30	32.4%	51.5%	5.1%	11.0%
31- 45	53.9%	26.7%	13.8%	5.6%
45 >	65.3%	13.0%	19.0%	2.7%

Table 2: Distribution of nodular and diffuse goiter patients among age groups and sexes.

Age groups (year)	NODULAR GOITER				DIFFUSE GOITER				Nodular / Diffuse
	Female	Male	Total	F/M Ratio	Female	Male	Total	F/M Ratio	
< 15	36	6	42 (22.1%)	6.0	108	40	148 (77.9%)	2.7	0.3
15- 30	605	96	701 (37.5%)	6.3	964	205	1169 (62.5%)	4.7	0.6
31- 45	886	227	1113 (67.7%)	3.9	438	93	531 (32.3%)	4.7	2.1
45 >	743	216	959 (84.3%)	3.4	148	31	179 (15.7%)	4.8	5.4

Many of the researchers point out that the incidence of goiter increases during puberty, and that the upward trend continues thereon, especially in women, becoming most frequent in both sexes in the age group 20-40 (4,7,10, 23,24). Our study has shown that the frequency of goiter is higher in women, and that for both sexes goiter incidence is highest, in the age group of 15-30. Greenspan *et al.* indicated that the incidence of goiter ranged in the region of 6-8% in North America, 5-80% in South America, 20-50% in Africa, 10-60% in Asia, and that Turkey is an endemic goiter area (17, 24). Roher, *et al.* found that the incidence of goiter in West Germany was 15% (19). According to the World Health Organization, the incidence of goiter in the world is approximately, 7% (25).

Regional studies done in USA obtained 0.47%, 3% and 2-4% for the percentage of nodular type in total goiter cases (26, 27). Mortenson, *et al.* found that 50% of cadavers with normal thyroid had nodules, in the 821 autopsies they performed (28). A recent study in USA, utilizing ultrasonography, showed that the incidence of nodules in the patients over 50 years of age was above 50% (29). In a mass study done in Turkey, in keeping with the WHO criteria, Urgancioglu *et al.* determined the incidence of goiter to be 30.5% and that of nodules to be 2.8%, out of a sample size of 73757 (11).

In this study, it was found that the female/male ratio of nodular goiter patients declines with age, while the opposite holds for diffuse goiter cases. We also observed that the dominant type of goiter, both in males and females, is nodular. Out of 4842 cases studied, 58.1% suffered from nodular goiter. In both sexes, the incidence of nodular goiter increased with age, while the opposite trend was true for diffuse goiter. Incidence of nodularity was 36.1% for those younger than 30 and 84.3% for those older than 45 years of age.

Combining the overall goiter incidence figure for Turkey of 30.5%, as determined by Urgancioglu, *et al.* and our finding of 58.1% nodularity, it can be estimated that the country-wide incidence of nodular goiter is close to 17%. That figure being much higher than the 2.8% reported by Urgancioglu, *et al.* we can claim that nodular goiter is an important health issue for Turkey. The rather large difference between our estimate and that given by Urgancioglu, *et al.* is attributable to the more sensitive and accurate methods of scintigraphic and ultrasonographic detection methods used by us; the earlier study relied on physical examination only. Especially, ultrasonography enables the detection of minute nodules that cannot be sensed during a physical examination. Our results appear in unison with the high incidence of nodules observed in ultrasonographic studies (17).

Roher, *et al.* reported the incidence of malignancy in goiters as 6.6%, while Greenspan, *et al.* found the incidence of malignancy to be 1% and 10-25% in multi-nodular and solitary nodule goiter cases, respectively (17, 19). Lennquist, *et al.* drew attention that the incidence of malignancy in thyroid can be as high as 60% in patients below 25 and in those above 60 years of age (18). Hence, the determination of the nodularity ratio, as well as the incidence of nodularity in the population, assume major importance in assessing the risks of malignancy in nodular goiter.

This study is the first one in Turkey which used the combination of scintigraphy and ultrasonography in differentiating the types of goiter in a series of patients, and thereby allowing a statistical approach to proving the importance of the two goiter types in the country.

#### CONCLUSION

In this study, we have undertaken a relatively large sample size, even though not a representative one for the who of Turkey, and shown that the incidence of nodular goiter far exceeds that of diffuse goiter. Further, we have concluded that the use of scintigraphy and ultrasonography to supplement physical examination is beneficial in determining the type of goiter, as well as in monitoring and curing of the disease.

#### REFERENCES

1. Berkow R, Talbott JH : Goiter. In the Merck Manual, 13th edition, Merck Sharp and Dohme Research Labs. Rahway, p 1264, 1977.
2. Bilir N : The problem of simple goiter in Turkey. *Toplum ve Hekim*, 41:23-27, 1986.
3. Hershman MJ, Due DT, Sharp B, et al : Endemic Goiter in Vietnam. *J Clin Endoc Metab*, 57:243-249, 1983.
4. Kologlu S : Endemic Goiter in Turkey. *Elif Matbaacilik*, Ankara, 1984.
5. Roti E, Gardini E, D'amato I, et al : Goiter Size and Thyroid Function in an endemic Goiter Area in Northern Italy. *J Clin Endoc Metab*, 63:558-562, 1986.
6. Urgancioglu I, Hatemi H, Kökoglu E, et al : Iodine Determination in Drinking Water Samples of Turkey; In Relation to the Endemic Goiter Problem. *Üstanbul, University of Istanbul*, p1-16, 1982.
7. Elmacioglu F : The status of simple goiter in Turkey, M.Sc. Thesis, Hacettepe University, Ankara, 1977.
8. Kologlu S : Thyroid Goiter. *Türkiye Klinikleri* 4:299, 1984.
9. Kologlu S, Baskal N, Uysal AR : The value of L-Thyroxine Suppression Therapy in the Prevention of Post-Thyroidectomy Recurrence. *Journal of Ankara Medical School* 10:467-480, 1988.

10. Köksal O : Nutrition in Turkey. In Köksal O (Ed), *Nutrition, Health and Food Consumption Research in Turkey for 1974*, Aydın Matbaası, Ankara, 1977.
11. Urgancıoğlu I, Hatemi H, Yenici O, et al : *Endemic Goiter in Turkey*. Istanbul, Ornek Matbaası, p 8-39, 1988.
12. Harbert J : *The Thyroid*. İn Harbert J, Rocha AFG (Eds.), *Textbook of Nuclear Medicine*, 2nd edition, Philadelphia, Lea and Febiger, p 3-52, 1984.
13. Ikekubo K, Higa T, Hirasa M, et al : *Evaluation of Radionuclide Imaging and Echography in the Diagnosis of Thyroid nodules*. *Clin Nucl Med*, 11:145, 1986.
14. Katz JF, Kane RA, Beyes J, et al : *Thyroid Nodules; Sonographic-Pathologic Correlation*. *Radiology*, 151:741-745, 1984.
15. Raikor UR, Sharma SM : *Ultrasound and Radionuclide Imaging in Management of Thyroid Nodules*. Presented at the *International Symposium on Nuclear Medicine and Related Medical Applications of Nuclear Techniques in Developing Countries organized by IAEA and WHO*, Vienna, 1986.
16. Simeone J, Mueller PR, Sonnenberg EV : *Sonography of Thyroid Gland*. In Leopold GR (Ed.), *Ultrasound in Breast and Endocrine Disease*, 1st edition, New York, Churchill Livingstone Inc, p 83-92, 1984.
17. Greenspan FS : *Thyroid nodules and thyroid cancer*. In Orla MC (Ed), *Endocrine Surgery of the Thyroid and Parathyroid Glands*, St Louis, CV Mosby Co, p 56-90, 1985.
18. Lennquist S : *The Thyroid Nodule Diagnosis and Surgical Treatment*. *Surg Clin North Am*, 67:213-232, 1987.
19. Roher HD, Goretzki PE : *Management of Goiter and Thyroid Nodules in an Area of Endemic Goiter*. *Surg Clin North Am*, 67:223-249, 1987.
20. Williams RH : *Textbook of Endocrinology*. Fourth Edition, WB Saunders Co, London, p 259-260, 1968.
21. Karpuzoğlu T, Akaydin M, Emek K, et al : *Surgical Approach in the Treatment of Thyroid patients at Akdeniz University Hospital*, Presented at the *Fourth Balkan Congress of Endocrinology*, Izmir, 1985.
22. Yilmaz M, Sencer E, Yenerman M, et al : *Diagnostic Value of Fine Needle Aspiration Biopsy in Nodular Goiter*, Presented at the *Fourth Balkan Congress of Endocrinology*, Izmir, 1985.
23. Clements FW : *Endemic goiter, nutrition and preventive medicine*. *WHO Monograph Series*, 62:83-93, 1976.
24. Eser S : *Nutrition and goiter in Northern Anatolia*, *Journal of Istanbul University Medical School*, 2:578-582, 1966.
25. Kelly FC, Snedden WW : *Prevalence of Distribution of Endemic Goiter*. *Bulletin WHO*, 18:5-173, 1958.
26. Greenspan FS : *Medical treatment of nodular goiters*. In Orlo Mc (ed.), *Endocrine Surgery of the Thyroid and Parathyroid Glands*, St. Louis, CV Mosby Co, p 35-55, 1985.
27. Mazzaferri EL, Santos ET, Keyhani SR : *Solitary Nodular Goiter; Diagnosis and Management*. In Geoks MC (Ed), *The Medical Clinics of North America*, WB Saunders Co, Philadelphia, 1988.
28. Mortenson JD, Woolner LB, Bennett AW : *Gross and Microscopic Findings in Clinically Normal Thyroid Glands*. *J Clin Endoc Metab*, 15:1270-1280, 1955.
29. Gharib H, Goellner JR : *Evaluation of nodular thyroid disease*. Young WF, Klee GG (Eds). *Diagnostic Evaluation of Endocrine Disorders II*, Philadelphia, WB Saunders Co, p 511-526, 1988.

Correspondence:  
Erkan Ibis  
Ankara Üniversitesi Tıp Fakültesi  
Nükleer Tıp Anabilim Dalı  
Cebeci-Ankara  
TÜRKİYE.