

## Original Research Article

# Nontoxic goiter: causes, clinical evaluation and management

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**Received:** 03 February 2018

**Accepted:** 31 March 2018

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### ABSTRACT

**Background:** Thyroid diseases are the commonest endocrine disorders worldwide and India is no exception. Goiter may be generalized or localized, toxic or nontoxic. The present study is being carried out in a government notified endemic area to study the etiology and surgical management with postoperative complications in patients with nontoxic goiter.

**Methods:** A observational study was carried out at a tertiary care academic hospital. Patients with a clinically diagnosed nontoxic goiter with normal T3, T4 and TSH values were included in the study. The study subjects underwent relevant investigations and surgical intervention. The outcome factors were histopathology of the surgically removed gland and postoperative complications.

**Results:** A total of 67 patients of nontoxic goiter were enrolled. The mean age of the patients was 33.3±11.1 years with female preponderance. The mean duration of the thyroid swelling was 2+/- 2 years. Hemithyroidectomy was most common surgery (68.7%) carried out. A majority (88%) of resected thyroid specimens were benign histopathologically as colloid goiter. An intergroup analysis was carried out between metabolic, autoimmune and neoplastic etiologies. Neoplastic etiology was significantly associated with smooth surface and hard consistency of the gland. Autoimmune goiter had significantly less than 12 months duration and painful. The postoperative complications observed were hypothyroidism (22.4%), hypoparathyroidism (10.5%), RLN palsy (6%) and SSI (3%).

**Conclusions:** Benign pathology was commonly seen with nontoxic goiter. Hypothyroidism and Hypoparathyroidism were the most frequent postoperative complications.

**Keywords:** Hypoparathyroidism, Management, Nontoxic goiter, Recurrent laryngeal nerve palsy

### INTRODUCTION

Thyroid diseases are the commonest endocrine disorders worldwide and India is no exception. It has been estimated that about 42 million people in India suffer from thyroid diseases.<sup>1</sup> Recent population studies have shown that about 12% of adults in India have a palpable goiter and Indian government has earmarked the goiter endemic regions in the country.<sup>2</sup> The nontoxic goiter is divided on the etiological basis as endemic goiter and

sporadic goiter. The endemic goiter is defined as one where more than 5% of the population shows thyroid enlargement.<sup>3</sup> The most common cause of goiter in goiter endemic areas is thought to be iodine deficiency but it is very difficult to establish the cause effect relationship in a hospital setting. The present study was carried out in a government notified endemic region to evaluate the nontoxic goiter patients for pattern of presentation, histopathological causes, with its surgical management and post-operative complications.

## METHODS

An observational study was carried out at a tertiary care academic hospital to evaluate the histopathological causes, clinical presentation, surgical management and immediate and delayed post-operative complications of patients with nontoxic goiter. Patients diagnosed clinically as having nontoxic thyroid swelling with T3, T4 and TSH within normal range were included in the study. Patients with recurrent thyroid swellings and those not consenting to get investigated or operated were excluded from the study. As this was an observational study, no formal sample size calculation was done, and data collection was done for 2 years. The study factors were clinical presentation, thyroid profile, serum calcium, ultrasonography of neck, fine needle aspiration cytology, indirect laryngoscopy, and nature of the surgery performed.

The outcome of the study was studied in terms of histopathology of the resected thyroid specimen and postoperative complications like neck hematoma, RLN palsy (temporary/ permanent), hypoparathyroidism (temporary/ permanent) and hypothyroidism. The patients were divided into 3 subgroups based on histopathology: Metabolic, Autoimmune and Neoplasm; and intergroup analysis was carried out to find out factors associated with neoplasm and autoimmune goiter taking metabolic

goiter patients as a base group. Continuous variables were analyzed using students' 't' test and categorical variables were evaluated using Chi-square or Fisher's exact test. The research protocol was approved by the IEC (Institutional Ethical Committee) and a written informed consent was obtained from all patients.

## RESULTS

A total of 67 patients were enrolled in the study with mean age of  $33.3 \pm 11.1$  years and range from 18 to 68 years. Nontoxic goiter was predominantly seen in females accounting for 86.6% and Male: Female ratio was 1:6.4. Most of the patients had localized thyroid enlargement (78%) and 22% had generalized gland enlargement. The mean duration of the swelling was  $2 \pm 1.9$  years and majority of these were painless swellings (75%).

Pain was a symptom in 25% of patients, significantly associated with autoimmune thyroiditis. All patients underwent neck ultrasonography with colour Doppler which showed benign appearance in 56 (83.6%) cases and malignant appearance in 11 (16.4%) cases. FNAC findings revealed Colloid Goiter in 36 (53.7%) cases, Nodular Goiter in 14 (20.9%) cases, Follicular Neoplasm in 7 (10.4%) cases, Hashimoto's Thyroiditis in 6 (8.9%) cases, and Papillary Carcinoma in 4 (5.9%) cases (Table 1)

**Table 1: FNAC findings and histopathological diagnosis of resected thyroid specimen**

		FNAC diagnosis	Histopathological diagnosis
Metabolic	Colloid Goiter	36 (53.7%)	34 (50.7%)
	Multinodular Goiter	14 (20.9%)	12 (17.9%)
Autoimmune	Hashimoto's Thyroiditis	6 (8.9%)	7 (10.4%)
Neoplastic	Follicular Adenoma	7 (10.4%)	6 (8.9%)
	Follicular Carcinoma		3 (4.5%)
	Papillary Carcinoma	4 (5.9%)	3 (4.5%)
	Follicular variant of papillary carcinoma		2 (2.9%)
Total		67 (100%)	67 (100%)

Hemithyroidectomy was the commonest surgical procedure performed (68.7%) followed by Subtotal thyroidectomy (16.4%) and Total thyroidectomy (14.9%). Completion thyroidectomies were performed in two patients with malignancy reported after performing hemithyroidectomy. None of the patients had postoperative operative site hematoma. Hypoparathyroidism as predicted by postoperative calcium levels  $< 8.5$  mg/dl was present in seven patients out of which six patients had transient hypoparathyroidism and one patient had permanent hypoparathyroidism as indicated by need for calcium supplementation beyond 12 months after total thyroidectomy. The patients suffering from hypoparathyroidism were managed according to the

severity of hypocalcaemia with parenteral or oral calcium and vitamin D supplementation. One patient who had undergone total thyroidectomy had bilateral recurrent laryngeal nerve palsy requiring tracheostomy postoperatively and three patients after hemithyroidectomies had transient recurrent laryngeal nerve palsy as diagnosed postoperatively by indirect laryngoscopy which recovered over 6 months period. Two patients had surgical site infection postoperatively. Fifteen patients had permanent hypothyroidism postoperatively requiring thyroxine supplementation out of which 12 had undergone total thyroidectomy and 3 had undergone hemithyroidectomy turning out to be Hashimoto's thyroiditis on histopathology (Table 2)

According to histopathology, Colloid goiter was seen in 34 patients (50.7%), followed by Multinodular goiter in 7 patients (17.9%), together (68.6%) which accounts for cases of Metabolic goiter. Autoimmune etiology

(Hashimoto's thyroiditis) was diagnosed in 10.4% of cases. Neoplastic etiology was diagnosed in 14(20.9%) patients out of which 8 were carcinoma and 6 were adenoma (Table 1).

**Table 2: Postoperative complications following thyroidectomy**

Complications	Hemithyroidectomy	Subtotal thyroidectomy	Total thyroidectomy	Total (n) (%)
<b>Early</b>				
Transient recurrent laryngeal nerve palsy	3	-	-	3 (4.5)
Transient hypoparathyroidism	1	3	2	6 (9%)
Hematoma	-	-	-	-
<b>Late</b>				
Hypothyroidism	3	-	12	15 (22.4%)
Permanent hypoparathyroidism	-	-	1	1 (1.5%)
Permanent recurrent laryngeal nerve palsy	-	-	1	1 (1.5%)
Surgical site infection	1	-	1	2 (3%)
Recurrence	-	-	-	-

The patients of nontoxic goiter were empirically divided in 3 sub-groups based on histopathology, namely: Metabolic, Autoimmune and Neoplastic nontoxic goiters. An intergroup analysis was carried out between metabolic/autoimmune etiologies and metabolic/neoplastic goiters and clinical features and findings were compared. On comparing autoimmune nontoxic goiter with patients of metabolic goiter, the duration of swelling less than 12 months with pain in the swelling was significantly associated with autoimmune goiter (p value=0.004 and 0.05 respectively). Swelling with smooth surface and hard consistency of the gland was significantly associated with neoplastic nontoxic goiter (p value=0.001 and 0.006 respectively). Ultrasonography was found to have 75% sensitivity, 93.2% specificity and 91% accuracy in the differentiating between malignant and benign goiters, while PPV and NPV were 60% and 96.5% respectively. FNAC was found to have 80% sensitivity, 98.2% specificity and 95.5% accuracy in the differentiating between malignant and benign masses, while PPV and NPV were 88.9% and 96.5% respectively.

## DISCUSSION

Nontoxic goiter is the most prevalent thyroid pathology worldwide characterized by localized or generalized thyroid enlargement with morphologically and/or functionally transformed follicles and euthyroidism.<sup>4</sup> Globally, 2.2 billion people live in areas with iodine deficiencies, with the risks goiter and its complications. In India, 167 million people are at risk of IDD (Iodine Deficiency Disorders), 54.4 million people have goiters,

and 8.8 million people have IDD related mental/motor handicaps.<sup>5</sup> IDD exists in all states and union territories; out of 587 districts in the country, 282 have been surveyed for IDD and 241 have been found to be goiter endemic.<sup>5</sup> The present study is of particular importance as it was carried out in a goiter endemic region. According to Indian Govt. Health records, the prevalence of goiter in the region where the study was carried out was an average 6.66% of all age groups. (Source of the data not revealed according to the policy). The present study evaluates the histological causes, surgical treatment and postoperative complications in nontoxic goiter patients in a tertiary care academic hospital. Nontoxic goiter was commonly observed in females in the present study and this is in concurrence with literature.<sup>6-9</sup> The mean age of the patients in the present study was 33.3 years, correlating well with other studies.<sup>9-11</sup> The presence of goiter/ thyroid swelling as an inclusion criteria was observed in all patients with localized enlargement in 78% and generalized enlargement in 22% of patients. The mean duration of the swelling was 2±1.9 years with a range of 2 months to 9 years which is consistent with literature.<sup>10,12</sup> Majority of the thyroid swellings are painless. Pain in the swelling was observed in 25.4% of patients in the present study correlating well with another study.<sup>11</sup> Pain can be significantly attributed to autoimmune etiology in the present study (p=0.05)

The Ultrasonography calls benign characteristics in 83.6% goiters and malignant characteristics in 16.4% goiters. The sensitivity and specificity was 75% and 93.2% respectively for differentiating between benign and malignant lesions. This is in accordance with the

literature.<sup>13,14</sup> FNAC is a simple, safe, outpatient based and cost-effective modality of investigating thyroid disease with high sensitivity and specificity.<sup>15</sup> FNAC in the present study was found to have 80% sensitivity, 98.2% specificity and high diagnostic accuracy of 95.5% which is comparable with other studies.<sup>16-18</sup>

The main indication for surgery in our series was the swelling itself either due to cosmetic reasons or fear of complications. Most commonly performed surgery was Hemithyroidectomy (68.7%) followed by Subtotal thyroidectomy (16.4%) and Total thyroidectomy (14.9%). This is in contrast to the study done by Rahman et al<sup>8</sup> where the surgeries performed were Subtotal thyroidectomy (75%), Near total thyroidectomy (13%), Hemithyroidectomy (7.4%) and Total thyroidectomy (5.6%). Colloid goiter was the commonest histopathological diagnosis accounting for 50.7% of cases followed by Multinodular goiter in 17.9%. These Metabolic causes together account for 68.6% of goiters studied. Autoimmune etiology in the form of Hashimoto's thyroiditis was diagnosed in 10.4% of cases which is comparable to study done by Ahuja. Neoplastic etiology was diagnosed in 20.9% comprising of papillary carcinoma (7.4%), Follicular carcinoma (4.5%) and Follicular adenoma (8.9%). The incidence of papillary carcinoma was comparable to another study on nontoxic goiter. The common postoperative complications in the present study were hypothyroidism, transient hypoparathyroidism and transient RLN palsy. The incidence of RLN palsy and hypoparathyroidism is comparable to other studies.<sup>19-23</sup> (Table 3, Table 4)

**Table 3: Comparison of postoperative hypoparathyroidism with other studies**

Authors	Incidence of hypoparathyroidism (%)
Karamanakos SN et al <sup>21</sup>	27.8%
Ozbas S et al <sup>22</sup>	17.5%
Zambudio et al <sup>23</sup>	9.6%
Present study	9%

**Table 4: Comparison of Postoperative RLN\* palsy with other studies**

Authors	Incidence of RLN* palsy
Karamanakos SN et al <sup>21</sup>	2.6%
Ozbas S et al <sup>22</sup>	1.6%
Zambudio et al <sup>23</sup>	9.6%
Present study	6 %

This study was an observational study where no formal sample size was calculated and patients in the study were recruited on an accrual basis. Absence of a comparison group as controls does not allow the present study to comment on the causative factors of goiter affirmatively.

## CONCLUSION

A major cause of nontoxic goiter in a government notified endemic region of Central India was colloid goiter of which majority had localized gland enlargement. The ultrasonography and FNAC were useful adjunct investigations which had modest sensitivity and high specificity for differentiating benign and malignant goiters. Postoperative complications observed were hypothyroidism, transient and permanent hypoparathyroidism and transient and permanent RLN palsy in the decreasing order of frequency.

## ACKNOWLEDGEMENTS

We are grateful to Dr. Kajal Mitra, Dean, NKPSIMS and Lata Mangeshkar Hospital for granting us the permission to conduct this study in this institute and publishing it. We would also like to thank Mr. Jaydeep Nayse for the statistical help.

*Funding: No funding sources*

*Conflict of interest: None declared*

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

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**Cite this article as:** Thakkar DB, Deshmukh SD, Akhtar M. Nontoxic goiter: causes, clinical evaluation and management. *Int Surg J* 2018;5:1873-7.