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Original Research Article

Prevalence of solitary thyroid nodule and evaluation of the risk factors associated with occurrence of malignancy in a solitary nodule of thyroid

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ABSTRACT

Background: A solitary nodule may become cosmetically distressing to a patient and occasionally causes pressure symptoms. Less frequently, an autonomously hyper functioning single nodule may cause hyperthyroidism. However, in the greater proportion of patients the major concern relates to the potential of malignancy with in such a nodule. Objective of present study was to study prevalence of solitary thyroid nodule and evaluate the risk factors associated with occurrence of malignancy in a solitary nodule of thyroid.
Methods: This is a prospective study of randomly selected patients with clinically palpable, solitary thyroid nodule diagnosed and treated at Prathima Institute of Medical Sciences Karimnagar. Total duration of study was two years, from 2010 October to 2012 September.
Results: The prevalence was found to be 19.2% in the present study. Majority were females i.e. 86.7%. It was found that maximum i.e. 36% of the cases belonged to the age group of 21-30 years. Swelling of the thyroid region was present in all cases. 97% of the patients were found to be euthyroid. FNAC showed that majority had follicular neoplasm. Hemi-thyroidectomy was the most common method used in 62 cases. Cytology diagnosis as Follicular neoplasm was the most common indication of surgery in 34 cases. Follicular adenoma was the most common histopathological finding in 43% of the cases. Benign lesion was the most common lesion in both males and females. Papillary cancer was the most common. The sensitivity of FNAC was found to be 94%.
Conclusions: FNAC is the gold standard for evaluation of solitary thyroid nodules with an accuracy of 94% in our study. Females are more commonly affected than Males. 11.4% of Solitary Thyroid nodules were malignant. Suspect malignancy at extremes of age. Malignant potential of solitary thyroid nodule after 6th decade is 50%.

Keywords: Prevalence, Risk factors, Thyroid nodule

INTRODUCTION

Solitary thyroid nodule can be defined as a goiter which on clinical examination appears to be a single nodule in an otherwise normal thyroid gland. Solitary thyroid nodule remains a common clinical problem.[1]

Virtually any disease of the thyroid can present as a solitary nodule. A solitary nodule has a high risk of being malignant (10-20%) than the multiple palpable nodules of a multi-nodular goiter (5%).[2]

A solitary nodule may become cosmetically distressing to a patient and occasionally causes pressure symptoms. Less frequently, an autonomously hyper functioning single nodule may cause hyperthyroidism. However, in the greater proportion of patients the major concern relates to the potential of malignancy with in such a nodule.[3]

Until recently, many clinicians have advised and practiced the routine surgical resection of all solitary thyroid nodules for definitive histological assessment.

Thyroid surgery, even in experienced hands is associated with definite morbidity and should not be undertaken lightly. It is logical to propose a more selective surgical policy for a patient with a solitary thyroid nodule, advising operation only for those individuals in whom cancer has been diagnosed or suspected or who are otherwise at risk of their goiter.[4]

The vast majority of thyroid nodules are benign and do not require removal. The physician or surgeon should be able to perform an accurate clinical assessment of any thyroid nodule, appreciate the risk factors for thyroid cancer, and be able to evaluate which patient would benefit from surgery.[5]

Conservative management is appropriate when malignancy can be reasonably excluded.

Present study was carried out to review the data regarding the prevalence of solitary thyroid nodule and analyze its distribution with respect to age, sex, etc., discussion of the clinical presentation and the significance of solitary thyroid nodule, to evaluate the risk factors associated with occurrence of malignancy in a solitary nodule of thyroid, to find out the percentage of malignancy in solitary nodule, to study the clinic pathological correlation of solitary thyroid nodules, to study the correlation of FNAC and biopsy. To study the sensitivity and specificity of FNAC, to provide a clinically applicable and cost-effective approach to the evaluation and management of solitary thyroid nodule were the objectives of present study.

METHODS

This is a prospective study of randomly selected patients with clinically palpable, solitary thyroid nodule diagnosed and treated at Prathima Institute of Medical Sciences Karimnagar. Total duration of study was two years, from 2010 October to 2012 September.

Institutional Ethics Committee permission was taken before the beginning of the study. After approval from the Institutional Ethics Committee the study was started. Informed consent was taken from each and every patient included in the present study.

For the present study, a pre designed, pre tested, semi structured study questionnaire was prepared. All data pertaining to history, clinical examination, investigations, management of each and every case involved in the present study was carefully and properly recorded in the above mentioned study questionnaire designed for the present study which was based on the extensive review of the literature concerning the topic of the present study.

Each patients Symptoms and signs were entered in a proforma with detailed clinical examination in relation to the thyroid swelling and lymph node involvement and a routine systemic and general examination was done.

All patients were subjected to basic investigations like complete hemogram, Blood sugar, Blood urea, serum cholesterol, urine analysis, chest radiogram and radiogram of neck. Tissue diagnosis was obtained by fine needle aspiration cytology in all the patients.

Thyroid profile and ultrasound was done in all the patients. Radioisotope scan was not done since the facility was not available at our hospital. Computed Tomogram scan (CT) was done in a patient with extensive neck secondaries. All operated specimens were subjected to Histopathological examination. Preoperative and postoperative complications were analyzed. Most cases were regularly followed up throughout the study period.

All the observations were analyzed and compared with other studies. Proportions were used to describe the data.

RESULTS

Table 1 shows prevalence of solitary thyroid nodule. The prevalence was found to be 19.2% in the present study.

Table 1: Prevalence of solitary thyroid nodule.

Number of thyroid cases admitted during study period	Number of cases of solitary thyroid nodule	Percentage
390	75	19.2

Table 2: Distribution of study subjects as per their sex.

Sex	Number	Percentage
Female	65	86.7
Male	19	13.3

Table 2 shows distribution of study subjects as per their sex. Majority were females i.e. 86.7% and males constituted only 13.3% of the solitary thyroid nodule cases.

Table 3: Distribution of study subjects as per their age.

Age (years)	Number	Percentage
Up to 20	08	11
21-30	27	36
31-40	27	36
41-50	14	18
51-60	02	03
61 and above	01	01

Table 3 shows distribution of study subjects as per their age. It was found that maximum i.e. 36% of the cases belonged to the age group of 21-30 years followed by 31-40 years i.e. 29%. Only one case was found in the age of 61 and above. After second decade, as the age increased the prevalence of solitary thyroid nodule decreased.

Table 4: Distribution of study subjects as per their clinical features.

Signs and symptoms	Number	Percentage
Swelling thyroid region	75	100
Pain	6	8
Toxic symptoms	2	2.6
Dyspnoea	3	4
Dysphagia	14	18.6
Regional palpable lymph node	2	3
Hoarseness of voice	1	1.3
Hard consistency	4	5.3

Table 4 shows distribution of study subjects as per their clinical features. Swelling of the thyroid region was present in all cases. The next most common symptom was dysphagia in 18.6% of the cases. Only one patient presented with hoarseness of voice.

Table 5: Distribution of study subjects as per their hormonal status (clinical).

Hormonal status	Number	Percentage
Euthyroid	73	97
Hyperthyroid	2	3
Hypothyroid	-	-

Table 5 shows distribution of study subjects as per their hormonal status (clinical). 97% of the patients were found to be euthyroid whereas only two patients were found to be hyperthyroid and none was found to be hypothyroid.

Table 6: Distribution of study subjects as per their FNAC report.

FNAC report	Number of patients
Follicular Neoplasm	34
Nodular Goiter	30
Papillary Carcinoma	4
Hashimoto's Thyroiditis	1
Thyroid cyst	1
No report possible	5

Table 7: Distribution of study subjects as per the management given.

Management given	Number of patients
Hemi-thyroidectomy	62
Subtotal thyroidectomy	4
Near total thyroidectomy	1
Total thyroidectomy with block dissection	2
Total thyroidectomy without block dissection	1
Conservative and follow up	3
Not willing for surgery	2

Table 6 shows distribution of study subjects as per their FNAC report. FNAC showed that majority had follicular neoplasm followed by nodular goiter. In five cases, the report was not possible.

Table 7 shows distribution of study subjects as per the management given. Hemi-thyroidectomy was the most common method used in 62 cases. Subtotal thyroidectomy was done in four cases. Total Thyroidectomy with block dissection was done in two cases.

Table 8: Distribution of study subjects as per the indications for surgery.

Indications for surgery	Number of patients
Cytology proven malignancy	4
Cytology diagnosis as follicular neoplasm	34
Clinical suspicion of malignancy with benign cytology	1
Thyroid cyst	1
Patient anxiety and cosmesis	30
Total	70

Table 8 shows distribution of study subjects as per the indications for surgery.

Cytology diagnosis as Follicular neoplasm was the most common indication of surgery in 34 cases. Patient anxiety and cosmesis was the next most common indication of surgery.

Table 9: Distribution of study subjects as per the histopathological report.

HPE report	Number	Percentage
Carcinoma		
Papillary Carcinoma	8	11.4
Follicular variant of papillary carcinoma	6	
Follicular carcinoma.	2	
Follicular Adenoma	30	43
Nodular Goiter	28	40
Hashimoto's Thyroiditis	2	2.8
Thyroid cyst	2	2.8
Total	70	

Table 9 shows distribution of study subjects as per the histopathological report. Follicular adenoma was the most common histopathological finding in 43% of the cases. Malignancy was reported in 11.4% of the cases.

Table 10 shows age and sex distribution of benign and malignant nodule. Benign lesion was the most common lesion in both males and females. Malignancy was common in older age groups in both the sexes.

Table 11 shows distribution of study subjects as per the histologically proven malignancy. Among all the cancers, papillary cancer was the most common found affecting 75% of the total cancer cases.

Table 10: Age and sex distribution of benign and malignant nodule.

Age (years)	Male			Female		
	Benign	Malignant	Total	Benign	Malignant	Total
Up to 20	1	1	2	10	2	12
21-30	1	0	1	22	0	22
3 1-40	1	0	1	15	1	16
41-50	2	2	4	6	0	6
51-60	1	1	2	2	0	2
61 and above	0	0	0	1	1	2
Total	6	4	10	56	4	60

Table 11: Distribution of study subjects as per the histologically proven malignancy.

Type	Number	Percentage
Papillary carcinoma	6	75
Follicular carcinoma	2	25
Medullary carcinoma	0	0

Table 12 shows accuracy rate of FNAC with histopathology as gold standard. The sensitivity of FNAC was found to be 94%.

Table 12: Accuracy rate of FNAC.

Result	True positive cases	False negative	False positive	Total
No. of cases	66	4	0	70
Percentage	94	6	0	

DISCUSSION

Solitary thyroid nodule represents thyroid pathology in about 19.2% of case. Out of 75 patients, 65 were females and 10 were males. This gives a Female: Male ratio = 6.5:1. Solitary thyroid nodule is 6.5 times more common in women. Similar findings were reported by Psarras et al and Bhansali SK.[7,8]

Considering the total number of admissions of any thyroid swelling, the female incidence is more partly because of increased prevalence and partly because of increased cosmetic awareness among young females.

In this study the youngest patient was 14 years old and the oldest was 65 years old. 80% of solitary nodules occurred during the age between 21-50 years. The highest incidence of 36% was recorded during the third decade of life. Similar findings were reported by Bhansali SK, Framingham study.[8,9]

All the patients had swelling and only single palpable nodule. Toxic symptoms were present in 2 patients. Clinical evidence of obstruction to airway or of the great veins of neck by a solitary thyroid nodule is rare. The presence of stridor, respiratory wheeze; engorgement of neck veins should be interpreted with caution and the possible existence of a second pathology with in the mediastinum or lungs should be considered while hoarseness of voice was present, only in one patient. On examination the only finding was hard consistency in 4 cases. In this study, 2 patients had regional lymph node enlargement; which on FNAC proved to be secondary deposits from papillary carcinoma. 14 patients had difficulty in swallowing and 6 patients, pain over the swelling, 3 patients had difficulty in breathing, which was mostly uncharacteristic, neither Exertional nor positional. Most of our patients were clinically in Euthyroid status. Only 2 patients came with toxic symptoms.

In this study the following investigations were done in included Urine analysis. Blood urea, Blood sugar, serum creatinine, radiograph of Neck, IDL scopy chest radiogram and fine needle aspiration cytology were carried out in the present study.

Serum T3, T4 and TSH estimation were done in all patients admitted and Hyperthyroidism was found in two patients. USG was done in all patients while CT scan, was done in a patient with extensive neck secondaries. Radio nucleotide scanning was not done for any of the patients due to the non- availability of the facility in our hospital.

Fine needle aspiration cytology represents a reliable method of providing a tissue diagnosis and is the investigation of choice for solitary thyroid nodule. In this study FNAC was a very dependable and an easy investigation without complications. It is the gold standard test for evaluating thyroid nodules mostly due to simplicity and easy availability of the tests.

Amongst the FNAC reports, follicular neoplasm was the commonest to be reported with the inability to identify vascular/capsular invasion. Adenomatous goiter, presenting as a solitary nodule was next commonest eventuality. 4 cases were reported as papillary carcinoma with two of them showing deposits in the neck nodes. No cases of MTC or Hurthle cell carcinoma were reported in our series. No report was possible in 5 cases. Total benign cases on FNAC were 66 accounting to a percentage of 88%. And total number of malignant cases was 4 with a percentage of 5.33%. Similar findings were reported by Ashcraft et al and Campbell et al.[10,11]

Out of 75 patients, 70 were submitted for surgery with below mentioned indications. 2 patients were given conservative line of management because of Ischemic heart disease. One another patient with Hashimoto's Thyroiditis also was put on conservative treatment. 2 patients were not willing for surgery. These patients were advised regular follow up, on a half yearly basis for re-examinations and repeat FNAC. Repeat FNAC was done in 2 of these patients and were reported as benign.

Provided there is no clinical suspicion of cancer and the cytology is again unequivocally benign, the individual is seen on an annual basis for re-examination and further FNAC.[13] This study includes two cases of solitary thyroid module with hyperthyroidism with benign cytology report. For these patients hemi thyroidectomy was done after preparation with anti-thyroid drugs, on the assumption that the solitary nodule is the overactive tissue, since Radioisotope scan was not available to study the functional status of the nodule and these patients had no recurrence of thyrotoxicosis

Total thyroidectomy was done for three patients of papillary carcinoma with neck node dissection (FND) in two patients, whereas neck node dissection was not done in 1 case. Near total thyroidectomy was done for a patient with papillary carcinoma leaving behind a strip of tissue on the side other than the nodule. Sub-total thyroidectomy was done for 4 patients who had nodules on contra lateral lobe preoperatively. Hemi-thyroidectomy, the standard surgical procedure for solitary thyroid nodule was done in 62 patients i.e., about 88% of patients who underwent surgery.

Surgery was done in a patient with an inconclusive FNAC report, based on clinical suspicion of malignancy. All resected specimens were submitted for histopathological examination. Histology proven malignancy in this series of study of solitary thyroid nodule is 11.4%., of which 75% (6 cases) were of papillary carcinoma and the rest 25% (2 cases) were of follicular carcinoma types. Of these, four cases were diagnosed preoperatively and were offered the confirmative treatment the rest four cases were diagnosed only on HPE reporting and then underwent completion total thyroidectomy without neck resection. All these patients are under regular follow-up with suppressive doses of thyroxin.

The histopathological report of all cases was well in comparison with a study done by Cohn J Russel BELFAST UK.[12] The Incidence of thyroid cancer in patients with a solitary thyroid nodule is 11.4%. This compares well with other studies like Psarras et al 7, and Bhansali SK.[7,8]

In present study 40% of solitary nodule in males proved to be malignant whereas in females only about 6% of the solitary nodules harbored malignancy. In present study, 50% of the cases are males, in that 75% of them developed malignancy after 40 years, whereas in females, 75% of cases were younger than 40 years.

Malignancy is more likely in a nodule in a child or a teenager or when a goiter develops in a patient aged 60 years or above.[13] 50% of thyroid cancers occurred in individuals under 40 years of age and of them 75% is papillary carcinoma.

Fravenhofer et al in his study of 125 cases of thyroid cancer found that 80% of thyroid cancers in individuals under 40 years of age was papillary carcinoma.[14] In present study out of 70 cases 6 cases were of papillary variety and 2 cases were diagnosed as follicular variety accounting to a percentage of 75% and 25% respectively.

No medullary carcinoma, anaplastic carcinoma and lymphoma were reported in our series. The relative incidence of primary malignant tumours in our series is almost in accordance with most of the above reported series. In present study, 50% of the cases, all of them males, developed malignancy after 40 years, whereas in females, 75% of cases were younger than 40 years.

Out of 70 cases operated 4 had different histopathology reports as compared to FNAC. If both FNAC & histopathology are benign or malignant they are considered true positive. 4 cytologically benign lesions were reported as malignant on histopathological examination. So FNAC was false negative in these cases.

In comparison overall accuracy rate greater than 94% was achieved in the cytological diagnosis of a solitary nodule. This correlates with other studies like Ashcraft et al and Campbell et al.[10,11]

The cytological appearances of follicular adenoma and follicular carcinoma are very similar. So, a cytological diagnosis of follicular neoplasm is only possible, and confirmation of diagnosis of follicular carcinoma depends upon the visualization of capillary and vascular invasion in histopathological examination.

Although the Cancer risk is only 20%, Russell CFJ, in common with others advises surgical resection of all solitary thyroid nodules reported as follicular neoplasm

cytologically.[12] In this study, 34 cases were diagnosed as follicular neoplasm cytologically and of these four were histologically malignant - 12% cancer risk. Authors have done Hemi-thyroidectomy for 62 patients. Total thyroidectomy for three patients with or without neck node dissection. All three were papillary carcinoma. Near total thyroidectomy was done for a case, also of papillary carcinoma.

Total Thyroidectomy is considered not only as a measure to reduce the recurrence rate of differentiated carcinoma but also as a means to prevent development of a highly malignant undifferentiated lesion. The percentage of radio iodine pick up can be increased several fold after total thyroidectomy and it also increases the sensitivity of thyroglobin as a post operative marker of residual / recurrent disease. The risk of permanent hypoparathyroidsm or recurrent laryngeal nerve damage is high. Authors have done near total thyroidectomy for one patient, a case of cytological proven papillary carcinoma, which was a small lesion (1.5 cm).

Near total thyroidectomy means leaving a fringe of thyroid tissue to preserve parathyroid. Indications for near total thyroidectomy include smaller lesions and better prognostic variants of papillary carcinoma thyroid.

Advantages of near total thyroidectomy are

- Lesser incidence of permanent or transient hypo parathyroidism
- Lesser incidence of recurrent laryngeal nerve palsy

Disadvantages of near total thyroidectomy are

- Follow up is difficult
- Remaining thyroid tissue has to be ablated for control of metastasis.

Out of the four false negative patients (cytologically benign) all were treated with hemi- thyroidectomy. All these patients were taken up for completion thyroidectomy because they fell into the high risk group and they had an uneventful post operative period and follow up.

Hemi-thyrodectomy (Ipsilateral lobectomy with isthmusectomy) is what is required in all patients with differentiated carcinoma of favorable prognosis as given in AGES scoring system. The favorable prognostic factors are lesion less than 2 cm without cervical or distant metastasis, age less than 40 years in males and less than 45 years in females.

So, the above patients were advised completion surgery with suppressive dose of thyroxin and regular follow-up.

The indications for isotope scanning after operation for differentiated cancer are.

- Unresectable local recurrence
- Metastatic disease
- High risk patients and
- Those with increase in serum thyroglobulin level.

Malignancy in a toxic nodule

In our study, two patients with clinical toxicity were reported as follicular neoplasm cytologically and as follicular adenoma histopathologically.

Adenoma

Out of the 70 cases operated 30 cases (43%) were histopathologically reported as adenoma. Most of them were macro follicular adenoma. Hemi-thyroidectomy was done for all the patients. Adenoma thyroid commonly occurred in the 3rd decade in this series of study.

Nodular goiter

28 cases (40%) were diagnosed as nodular goiter; hemi-thyroidectomy was done for most of them. 4 patients had nodules in the contra lateral lobe also, which were revealed per operatively, hence sub-total thyroidectomy was done. Out of the 70 patients operated, two developed features of hypocalcaemia in the immediate post operative period and were revived with intravenous, calcium gluconate and with need for oral calcium supplementation.

Two patients had sluggish movement of left vocal cord after total thyroidectomy and improved later. Seven patients had post operative wound infections. We had no mortality during this study.

CONCLUSION

FNAC is the gold standard for evaluation of solitary thyroid nodules with an accuracy of 94% in our study. Females are more commonly affected than males. 11.4% of solitary thyroid nodules were malignant. Suspect malignancy at extremes of age. Malignant potential of solitary thyroid nodule after 6th decade is 50%. 50% of thyroid cancers occurred in patients less than 40 years, of them 75% were papillary carcinoma. Operative procedures in treatment of solitary thyroid nodule are justified, as they provide the specimen for correct diagnosis. The morbidity and mortality rate are very low and, in most cases, no further surgery is required, if the pathological process is confined to one lobe. Hemi-thyroidectomy is the minimum surgical procedure for single nodule. Cancer risk in a follicular neoplasm is 12% cytologically. For malignant nodules total thyroidectomy is the ideal procedure. Near total thyroidectomy is also acceptable as the oncological clearance is same with Lower complication rates. Patients being submitted to thyroidectomy should be counseled preoperatively with regard to risk of recurrent laryngeal nerve paralysis.

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REFERENCES

1. Taylor S. Evolution of nodular goiter. J Clin Endocrinol Metab. 1953;13(10):1232-47.
2. Giddings AE. The history of Thyroidectomy. J R Soc Med. 1998;91(Suppl 33):3-6.
3. Spitzweg C, Heufelder AE, Morris JC. Thyroid iodine transport. Thyroid. 2000;10:321-30.
4. Brent GA. The molecular basis of thyroid hormone action. N Engl J Med. 1994;331:847-853.
5. Roman SA. Endocrine tumors: Evaluation of thyroid nodule. Curr Opin Oncol. 2003;15:66-70.
6. Caplan RH, Wester SM, Lambert PJ, Rooney BJ. Efficient evaluation of thyroid nodules by primary care providers and thyroid specialists. Am J Manag Care. 2000;6(10):1134-40.
7. Psarras A, Papadopoulos SN, Livadas D, Pharmakiotis AD, Koutras DA. The single thyroid nodule. BJS. 1972;59:545-548.
8. Bhansali SK. Solitary nodule in thyroid gland. Indian J Surg. 1982;55:547.
9. Vander JB, Gaston EA, Dawber TR. The significance of non toxic, thyroid nodules, Final Report of a 15 year study on incidence of Thyroid Malignancy. Ann Int Med. 1968;69:537-40.
10. Ashcraft MW, Van Hurle AJ. Management of Thyroid Nodules- Iodine scanning techniques, thyroid suppressive therapy and fine needle aspiration. Head Neck Surg. 1981;3:297-322.
11. Campbell JP, Pilisbury HC. Management of the thyroid nodule. Head Neck Surg. 1989;11:414-25.
12. Russell CFJ. The management of the solitary thyroid nodule. In: Taylor I, Johnson CD, editors. Recent Advances in Surgery 17th ed. Churchill Livingston, London;1995:16.
13. Mazzaferri EL. Management of a solitary thyroid nodule. N Engl J Med. 1993;328:553-9.
14. Frauenhofer CM, Patchefsky AS, Cobanoglu A. Thyroid carcinoma: A clinical and pathological study of 125 cases. Cancer. 1979;43(6):2414-21.

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