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Original Research Article

Study on clinico-pathological, ultrasound and thyroid status in solitary nodule of thyroid

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Abstract:

Background: Thyroid nodules are very common problems that are encountered and their incidence varies and is dependent on the geography of the region. Solitary thyroid nodule (STN) can have a variety of presentations most often it initially occurs as an asymmetrical enlargement of the affected lobe like in chronic lymphocytic thyroiditis that is Hashimoto's thyroiditis or a simple goiter.

Objective: To study clinico-pathological, ultrasound features and status of thyroid in patients with STN

Methods: Hospital based prospective study was carried out among 50 cases of STN. These cases were studied in detail clinically. Routine investigations and specific investigations including thyroid profile, fine needle aspiration cytology (FNAC) of the nodule, Plain X-ray neck, ultrasonography (USG) neck was done in all cases. Hemi thyroidectomy was the surgery of choice except in cases proven as malignant in FNAC or in suspicious cases.

Results: Females were more (92%) compared to males (8%). Most commonly affected age group was 31-40 years (36%). Most common site of nodule was right loge (66%). FNAC revealed that it was benign in 42%. Most commonly done surgery was hemi thyroidectomy (78%). Only five cases had postoperative complications like hypocalcemia (3) and vocal cord palsy (2). As per histopathological report most common was colloid goiter (46%). Consistency and thyroid profile status were not associated with type of surgery or postoperative complications ($p>0.05$). FNAC result other than benign was significantly associated with type of surgery and postoperative complications($p<0.05$).

Conclusion: Females are more affected than males with the solitary thyroid nodule (STN). Most of them were euthyroid. Right lobe is commonly affected with STN. FNAC result other than benign was significantly associated with type of surgery and postoperative complications.

Key words: Solitary nodule, thyroid, ultrasound, clinico-pathological

Introduction

Thyroid gland is considered as one of the prime endocrine organs that is responsible for managing and coordinating almost every system in the body. One of the problems associated with thyroid is its enlargement that is referred to as the goiter. [1]

Among the various types of goiter, the solitary thyroid nodule has gained a special place because it is known to have an association with malignancy as compared to a diffusely enlarged thyroid gland or multinodular goiter. [2]

Thyroid nodules are very common problems that are encountered and their incidence varies and is dependent on the geography of the region. It is estimated that the incidence of thyroid nodules in a general population can range anywhere between 4% and 7%. [3]

This incidence of a higher rate of malignancy in solitary thyroid nodule as compared to a multi nodular goiter was first documented by Warren H in the year 1949 when the thyroidologist aroused this interest. [4]

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Most of the thyroid nodules that are solitary in nature are hyperplastic lesions that are benign but malignancy is also seen and is known to occur in approximately 5 to 20% of cases. Solitary thyroid nodule can have a variety of presentations most often it initially occurs as an asymmetrical enlargement of the affected lobe like in chronic lymphocytic thyroiditis that is Hashimoto's thyroiditis or a simple goiter. In general, a solitary nodule is defined as "a palpable single clinically detected nodule in the thyroid gland that is otherwise normal". Visibility or palpability of opposite thyroid lobe precludes inclusion of such cases in this group. [5]

Present study was carried out to study the thyroid status (euthyroid, hyperthyroid or hypothyroid states) in Solitary nodule of thyroid patients, to study the role of FNAC in the management of solitary nodule of the thyroid and to determine the incidence of adenoma, carcinoma and thyroiditis as a cause of solitary nodule of thyroid.

Material and methods

Hospital based observational study was carried out at Department of General Surgery, Malla Reddy Institute of Medical Sciences, Suraram, Medchal from January 2020 to June 2021 for a period of 18 Months among 50 cases of patients diagnosed with solitary thyroid nodule.

Patients aged 15-70 years of either gender, willing to give consent to take part in the study were included in the present study. Those who refused to participate, pregnant women, already known cases of multi-nodular goiter were excluded from the present study.

After the approval from the scientific and ethics committee patients were enrolled in study as per inclusion and exclusion criteria. Analysis of 50 cases of solitary nodule of thyroid in a specified period was done. These cases were studied in detail clinically and recorded as per the proforma after taking informed consent from the patients. Routine investigations and specific investigations including thyroid profile, fine needle aspiration cytology (FNAC) of the nodule, Plain X-ray neck, ultrasonography (USG) neck was done in all cases.

Institution Ethics Committee approval was taken vide letter number IEC/MRIMS/105/2019 dated 21/12/2019 after the Scientific committee approval. Written informed consent was taken from all eligible study participants. Any co-morbidity detected were treated appropriately during the period of study as per the standard hospital treatment guidelines.

The patients were grouped according to different variables like, Site of the nodule, functional thyroid status, FNAC report and histopathological examination.

Preoperatively use of antithyroid drugs, beta blockers, blood transfusions or any other medications were prescribed based on the individual status and was noted. Hemi thyroidectomy was the surgery of choice in solitary nodule of thyroid except in cases proven as malignant in FNAC or in suspicious cases. Surgery was planned under general anesthesia, and preoperative findings were recorded. Postoperatively every patient was followed up postoperatively during the course of management in the hospital to note the development and management of any complications.

Statistical analysis:

All the data is collected in approved proforma and data is entered in MS excel 2007, and is subjected to statistical analysis. The data was expressed as proportions and numbers. The association was tested using the Chi square test and p value less than 0.05 was considered as statistically significant.

Results:

Table 1: Age and sex distribution

Age (years)	Female	Male	Total
21-30	12 (26.1%)	0	12 (24%)
31-40	16 (34.8%)	2 (50%)	18 (36%)
41-50	11 (23.9%)	1 (25%)	12 (24%)
51-60	5 (10.9%)	1 (25%)	6 (12%)
61-70	2 (4.3%)	0	2 (4%)
Total	46 (92%)	4 (8%)	50 (100%)

females were more (92%) compared to males (8%). Most commonly affected age group was 31-40 years in 36% of the cases followed by 21-30 years and 41-50 years in 24% of the cases each. (Table 1)

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Table 2: Distribution as per clinical features

Features		Number	%
Presenting symptoms	Swelling in front of neck	50	100
Site of nodule	Isthmus	1	2
	Left lobe	16	32
	Right lobe	33	66
Consistency	Firm	39	78
	Hard	8	16
	Soft-firm	1	2
	Soft	2	4
Thyroid profile	Euthyroid	48	96
	Hyperthyroid	2	4
Ultra-sonogram	Homogenous	42	84
	Heterogeneous	8	16
FNAC	Benign	21	42
	Follicular neoplasm	16	32
	Suspicious	2	4
	Malignant	5	10
	Non diagnostic	5	10
	Thyroiditis	1	2

All the patients presented with swelling in front of the neck. Most common site of nodule was right loge in 66% of the cases. 78% of the cases had firm consistency of the nodule. 96% were euthyroid and in 84% of the cases, the USG revealed that the swelling was homogeneous. FNAC revealed that it was benign in 42% of the cases. (Table 2)

Table 3: Surgical characteristics

Surgical characteristics		Number	%
Type of surgery	Hemi thyroidectomy	39	78
	Sub Total Thyroidectomy	2	4
	Total Thyroidectomy	8	16
	Total Thyroidectomy, Lymph Node Dissection	1	2
Postoperative complications	Hypocalcemia	3	6
	Vocal cord palsy	2	4

Most commonly done surgery was hemi thyroidectomy in 78% of the cases followed by total thyroidectomy in 16% of the cases. Only five cases had postoperative complications like hypocalcemia in three and vocal cord palsy in two cases.

Table 4: Histopathological Report

Histopathological Report	Number	%
Colloid goiter	23	46
Thyroiditis	1	2
Follicular adenoma	19	38
Papillary carcinoma	7	14

Histopathological report revealed that the most common finding was colloid goiter in 46% of the cases followed by follicular adenoma in 38% of the cases. (Table 4)

Table 5: Association of factors with type of surgery

Factors		Type of surgery		p
		Hemi thyroidectomy	All other types	
Consistency of thyroid gland	Firm	31 (79.5%)	8 (20.5%)	0.854
	Hard	6 (75%)	2 (25%)	
	Soft/soft-firm	2 (66.7%)	1 (33.3%)	
	Euthyroid	31 (77.1%)	11 (22.9%)	0.443

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Thyroid profile status	Hyperthyroid	2 (100%)	0	
FNAC status	Benign	37 (97.4%)	1 (2.6%)	0.000
	Malignant/not-determined/suspected	2 (16.7%)	10 (83.3%)	

The consistency and thyroid profile status were not associated with the type of surgery (p>0.05). 83.3% of the cases who had FNAC result other than benign underwent surgery other than hemi thyroidectomy compared to only two who underwent hemi thyroidectomy. 97.4% of the cases who had FNAC result as benign underwent hemi thyroidectomy. This association was found to be statistically significant (p<0.05). (Table 5)

Table 6: Association of factors with postoperative complications

Factors		Postoperative Complications		p
		Yes	No	
Consistency of thyroid gland	Firm	3 (7.7%)	36 (92.3%)	0.350
	Hard	1 (12.5%)	7 (87.5%)	
	Soft/soft-firm	1 (33.3%)	2 (66.7%)	
Thyroid profile status	Euthyroid	5 (10.4%)	43 (89.6%)	0.630
	Hyperthyroid	0	2 (100%)	
FNAC status	Benign	1 (2.6%)	37 (97.4%)	0.002
	Malignant/not-determined/suspected	4 (33.3%)	8 (66.7%)	

The consistency and thyroid profile status were not associated with the postoperative complications of surgery (p>0.05). 33.3% of the cases who had FNAC result other than benign had postoperative complications compared to only 2.6% who had FNAC result as benign underwent hemi thyroidectomy. This association was found to be statistically significant (p<0.05). (Table 6)

Discussion:

Thyroid gland is considered as one of the prime endocrine organs that is responsible for managing and coordinating almost every system in the body. One of the problems associated with thyroid is its enlargement referred to as the goiter. Thyroid nodules are very common problems that are encountered and it is estimated that the incidence of thyroid nodules in a general population can be as high as 7 %. The solitary thyroid nodule is known to have a higher association with malignancy as compared to other types of goiter. The management of a thyroid nodule is often thyroidectomy. Thyroidectomy is one of the most common procedures performed by surgeons for benign and malignant conditions of the thyroid. However, depending on the preoperative diagnosis and FNAC report the type of thyroidectomy differs. For benign lesions the surgery of choice is hemi thyroidectomy. The type of surgery done like subtotal thyroidectomy, near total thyroidectomy or total thyroidectomy and additional measures like neck dissection depends on the histology. The current study aims to assess the occurrence of the various clinico-pathological, ultrasound and thyroid findings in solitary nodule of thyroid and to determine the incidence of adenoma, carcinoma and thyroiditis as a cause of solitary nodule of thyroid and prompt management for the reduction of morbidity and providing the patient with the best chance of a satisfactory outcome.

The study was an observational study in the Department of General Surgery, Malla Reddy Institute of Medical Sciences, Suraram, Medchal between January 2020 To June 2021 for a period of 18 Months of patients ranging from 15 years to 70 years of either gender. Here below we discuss the findings with other studies.

In the present study of 50 patients with solitary thyroid nodule, peak incidence was between 3rd to 4th decade. The mean age of presentation was 39 years. Youngest patient was of the age of 21 years while the oldest was 62 years of age. Baldassarre RL et al [6] noted that mean age was 48 years. The Mean age of other studies similar to the present study are as follows Jena A et al: 36.8 years [7] Talepoor M et al [8] As per the study done at various places we noted that solitary thyroid nodules are commonly seen in the age group of 30 to 40 years. With respect to age in the present study noted that the age group of 23 to 63 years had a higher incidence of malignant potential in solitary thyroid nodules. As compared to other malignancies thyroid cancers occur in the younger age group. In the present study also we noted that papillary cancer was seen in the age group 25 to 45 years.

The most common gender in solitary thyroid nodule, with male to female ratio being 1: 11.5 in the present study. 92 % were females and 8 % were males. This is in accordance with most studies as they show similar findings [6-8] of female dominance.

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Thyroid profile status in the present study out of 50 patients in the study majority were euthyroid 48 (96%) patients and only 2 (4%) patients had hyperthyroidism features. These patients were made euthyroid before being taken for surgery using antithyroid drug and propranolol. In the study by Del Rio P et al [9] 18.1% were hyperthyroid and 81.9% were euthyroid. Jena A et al [7] noted that 94.6% as euthyroid, and 2.7% were hypothyroid, 2.7% hyperthyroid at the time of presentation. In the study by Gupta M et al [10] thyroid profile revealed all 100% as euthyroid. Al-Doghan IE et al [11] thyroid profile revealed 85.19% as euthyroid, 3.7% as hypothyroid, and 11.1% was hyperthyroid. Gupta M et al [10], Al-Doghan IE et al [11], Del Rio P et al [9], Jena A et al [7] had most cases who were euthyroid similar to the present study.

In the present study Right lobe was involved in 66% of cases, left lobe in 32%, while nodule was present in isthmus in 2% of cases out of 50 cases. Al-Doghan IE et al [11] observed from their study that 64.8% had Right lobe involvement, left lobe was involved in 29.6%, and isthmus was involved in 5.6%. Rao BH et al [12] also noted that right side was commonly involved in those who had solitary thyroid nodule, he also noted that malignancy was commoner in the right side. It was also noted that 5 out the 7 malignancies that were seen were on the right side. In studies by Rao BH et al [12] the percentage of involvement the right lobe of the thyroid is 59%, In the study by Al-Doghan IE et al [11] the percentage of involvement of the right lobe is 64.8%, In the present study the percentage of involvement of the right lobe is 66% therefore, the Side involvement in the present study is in accordance with the other studies.

As per the FNAC, benign colloid goiter was diagnosed in 21 (42%), follicular neoplasm was diagnosed in 16 (32%), suspicious of malignancy in 2 (4%), malignant in 5 (10%), non-diagnostic was diagnosed in 5 (10%), and thyroiditis 1 (2%).

Del Rio P et al [9] noted thyroiditis in 34.5% cases and 65.5% cases with glandular chronic inflammation. Rao BH et al [12] noted Benign in 57%, Malignant in 6% Suspicious in 30%, Intermediate in 7% cases. FNAC findings of the benign lesions of this study was compared with the study by Tarrar AM et al. [13] The findings in this study showed, Colloid goiter in 21 cases (42 %), Follicular neoplasm in 16 cases (32%) and thyroiditis in one case (2%). Study by Tarrar AM et al [13] showed 7.69% of follicular neoplasm and 67.3% of colloid goiter. Therefore, the study by Tarrar AM et al [13] showed more incidence of colloid goiter in their study. This may be because of the study was in iodine deficient areas in Kashmir valley.

Out of 50 cases in the study five cases were diagnosed as malignancy on FNAC. Pinchot SN et al [14] in their study, reported the incidence of malignancy as 28%. In the study of Bhatta S et al [15] the incidence of malignancy was 13.3% in the study group of 90 patients. Tarrar AM et al [13] reported the incidence of malignancy on FNAC as only 4%. In the study by Kaur K et al [16] reported the incidence of malignancy as 18%. In the study by Sclabas GM et al [17] the incidence of malignancy was 32%. In the study by Muratli A et al [18] the incidence of malignancy was 17.6%. In the present study the incidence of malignancy on FNAC is 10%. The present study is therefore in accordance with the other studies.

In the study by Baldassarre RL et al [6] total thyroidectomy was done in 95.5%, Lobectomy was done in 0.5%. In the study by Rao BH et al [12] hemi thyroidectomy was done in 85.12%, Near total thyroidectomy in 9.5%, Total thyroidectomy in 2.6 %, Total thyroidectomy with LN dissection in 4.1%. In this study, Hemi thyroidectomy was done in 78%, Sub Total Thyroidectomy was done in 2%, Total Thyroidectomy was done in 16%, Total thyroidectomy with lymph node dissection in 2% cases.

In the present study we included all cases of hypocalcemia. All of them recovered hence we did not have any cases of permanent hypocalcemia. Hypocalcemia was seen in 6% cases. It was transient and improved over 2 to 6 weeks post operatively. A study by Bhattacharyya N et al [19] done in 2002 on 517 patients showed that hypocalcemia was seen in 6.2% cases in post-operative period.

In this study the 3 patients who developed hypocalcaemia following total thyroidectomy were of normal or under normal muscular built. We also noted that in those patients who had abnormal thyroid levels preoperatively had a higher chance of developing hypocalcemia. Those who underwent surgery for benign disease had a lesser incidence of hypocalcaemia than those who had underwent surgery for a malignant disease. In those patients who had pre-operative lower calcium levels that had a higher incidence of hypocalcemia in postoperative period. Taking in consideration preoperative and postoperative serum calcium levels we found that there was a mean Peri operative calcium decrease of 1.203 mg / dl. In the present study we noted that there was a higher incidence of hypocalcemia in those who had a larger thyroid or features of thyroiditis or malignancy. The study also noted that in those patients who had abnormal thyroid levels preoperatively had a higher chance of developing hypocalcemia. Those who underwent surgery for benign disease had a lesser incidence of hypocalcaemia when compared with those who underwent surgery for a malignant disease. In those patients who had pre-operative lower calcium levels had a higher incidence of hypocalcemia postoperative. The study also noticed that in those patients who had a decreasing trend from day 1 in the calcium levels the degree of fall from preoperative to postoperative levels were very high.

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A study by Bhattacharyya N et al [19] done in 2002 on 517 patients showed that the most common indications for thyroidectomy was malignancy and goiter. In a study by Nasir B et al [20] the incidence of postoperative wound hematoma was 1.0%, wound infection was 2.0%, hypocalcemia was 6.2%, unilateral and bilateral vocal cord paralysis were 0.77% and 0.39% respectively. The mean length of stay was 2.5 days and was unaffected by the occurrence of postoperative hypocalcemia. In the present study all the complications were temporary and recovered in a due course of time. Two cases that is 4 % had vocal cord paresis and three cases that is 6% had hypocalcemia, and no other complications were seen. Hypocalcemia was transient and improved over 2 to 6 weeks post operatively, Vocal cord palsy seen presented with hoarseness of voice was transient and all cases improved by 4 weeks, those who had thyroiditis had a higher incidence of complications.

The commonest findings were nodular colloid goiter that was present in 23 cases (46%),19 cases (38%) of follicular adenoma, 1 case (2%) of thyroiditis, 7 cases (14%) of papillary carcinoma were detected. Del Rio P et al [9] noted that 65.2 % were benign and rest 34.8% were malignant. Al-Doghan IE et al [11] found in their study that follicular adenoma was present in 9.3%, Colloid in 62 (83.78%) % and Papillary carcinoma in 7.4 %. Gupta M et al [10] based on the HPE 56% had colloid nodular goiter, 16 % were follicular adenoma and papillary carcinoma each, 4% were hurthle cell adenoma, hurthle cell changes with capsular invasion and Hashimoto's thyroiditis respectively. Rao BH et al [12] had nodular colloid goiter in 50.3%, follicular adenoma in 28.4%, papillary carcinoma in 11.5%, thyroiditis in 1.6% and multi nodular goiter in 7.8%. Khadilkar UN et al [21] stated that Involutional colloid nodule was the predominant type of solitary nodule (52%). Among the malignant neoplasms, Papillary carcinoma was the commonest solitary nodule (13%).

Among the malignant lesions on is the histopathology, papillary carcinoma was 14%. The frequency of histological types of carcinomas in Sclabas et al [17] was 82% of papillary carcinoma. The incidence of Papillary carcinoma in the study of Muratli et al [18] which was 26.2%. The incidence of Papillary carcinoma in the study by Scott N. Pinchot et al [14] was 72%. In the study by Bhatta S et al [15] the incidence of papillary carcinoma was 69.2%. From the present study, the incidence of papillary carcinoma by histopathology is 14%. When compared with the other studies the incidence of Papillary carcinoma on histology is less in the present study.

Conclusion:

Females are more affected than males with the solitary thyroid nodule (STN). Most of them were euthyroid. Right lobe is commonly affected with STN. FNAC result other than benign was significantly associated with type of surgery and postoperative complications.

References:

1. Orlo H, Clark, Nadine R. Caron., Thyroid disorders. In: Mastery of Surgery. Josef E. Fischer, editor, 5th ed. 2015: pp. 1:398
2. Cole WH, Watne AL. Incidence of carcinoma of the thyroid in nodular goiter. Semi Surg Oncol 1991; 7(2):61-63
3. Bomeli SR, LeBeau SO, Ferris RL. Evaluation of a thyroid nodule. Otolaryngol Clin North Am. 2010 Apr; 43(2):229-38
4. Cole WH, Majarakis JD, SLAUGHTER DP. Incidence of carcinoma of the thyroid in nodular goiter. J Clin Endocrinol 1949 Oct 1; 9(10):1007-11.
5. Policeni BA, Smoker WR, Reede DL. Anatomy and embryology of the thyroid and parathyroid glands. Seminars in Ultrasound, CT and MRI.WB Saunders. 2012 Apr; 33 (2):104-114
6. Baldassarre RL, Chang DC, Brumund KT, Bouvet M. Predictors of hypocalcemia after thyroidectomy: results from the nationwide inpatient sample. ISRN surgery. 2012;2012.
7. Jena A, Patnayak R, Prakash J, Sachan A, Suresh V, Lakshmi AY. Malignancy in solitary thyroid nodule: A clinico-radio-pathological evaluation. Indian J Endocrinol Metab 2015 Jul; 19(4):498.
8. Talepoor M, Karbankhsh M, Mirzaii FA, Zargar M. Management of solitary thyroid nodules: the dilemma of multinodular goiter as false-positive cases. Medicine On-Line. 2005; 1:1-6.
9. Del Rio P, Rossini M, Montana CM, Viani L, Pedrazzi G, Loderer T et al. Postoperative hypocalcemia: analysis of factors influencing early hypocalcemia development following thyroid surgery. BMC surgery. 2019 Apr 1; 18(1):25.
10. Gupta, M., Gupta, S, Gupta VB. Correlation of Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule. Journal of Thyroid Research 2010; 2010:379051
11. Al-Doghan IE, Jasim HA, Hussein FM. Evaluation of solitary thyroid nodule at AL-Yarmouk teaching hospital. JPMA. J Pak Med Assoc 2019 Aug; 69(8): S45-9.
12. Rao BH, Chakravarthy KS. Study of incidence in between benign and malignant tumors of solitary thyroid nodule. Int J Res Med Sci 2016 Dec; 4(12):5288.

ISSN:0975-3583,0976-2833 VOL14,ISSUE05,2023

13. Tarrar AM, Wahla MS, Ilyas S, Khan OU, Waqas A, Raza A. Solitary thyroid nodule. Prof Med J 2010 Dec 10; 17(04):598-602.
14. Pinchot SN, Al-Wagih H, Schaefer S, Sippel R, Chen H. Accuracy of fine needle aspiration biopsy for predicting neoplasm or carcinoma in thyroid nodules 4 cm or larger. Arch Surg 2009 Jul 20; 144(7):649-55.
15. Bhatta S, Makaju R, Mohammad A. Role of fine needle aspiration cytology in the diagnosis of thyroid lesions. J Pathol Nepal. 2012; 2(3):186-8.
16. Kaur K, Sonkhya N, Bapna AS, Mital P. A comparative study of fine needle aspiration cytology, ultrasonography and radionuclide scan in the management of solitary thyroid nodule: A prospective analysis of fifty cases. Indian J Otolaryngol Head Neck Surg 2002 Apr; 54(2):96-101.
17. Sclabas GM, Staerkel GA, Shapiro SE, Fornage BD, Sherman SI, Vassillopoulou-Sellin R et al. Fine-needle aspiration of the thyroid and correlation with histopathology in a contemporary series of 240 patients. Am J Surg 2003 Dec 1; 186(6):702-10.
18. Muratli A, Erdogan N, Sevim S, Unal I, Akyuz S. Diagnostic efficacy and importance of fine-needle aspiration cytology of thyroid nodules. J Cytol 2014 Apr; 31(2):73.
19. Bhattacharyya N, Fried MP. Assessment of the morbidity and complications of total thyroidectomy. Arch Otolaryngol Head Neck Surg 2002 Apr 1; 128(4):389-392.
20. Nasir B, Qubati M, Qubati S, Al-Tamimi A, Rabo YA, Aljounaeed A et al. Solitary Thyroid Nodule: Clinical, Sonography and Pathological Evaluation Risk of Malignancy. Int J Otolaryngol Head Neck Surg 2021; 10(5):441-476.
21. Khadilkar UN, Maji P. Histopathological study of solitary nodules of thyroid. Kathmandu University Med J 2008; 6(4):486-90.