

Comparison of demographic distribution of colloid goiter on USG-guided biopsy with free guided biopsy and confirm the same with cytohistopathological diagnosis in a study population

Irfan khan¹, Mohsin ul rasool^{2*}, Imran Khan³, Sajad Hamid⁴

1. Department of Blood Bank, SKIMS, Soura, India
2. Department of Pathology, SKIMS Medical College, India
3. Department of Internal Medicine, SKIMS, Soura, India
4. Lecturer Department of Anatomy & Histology, SKIMS Medical College

*Corresponding author: Dr. Mohsin ul rasool; Department of Pathology, SKIMS Medical College, Soura, India; E-mail: drsajadk@rediffmail.com

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ABSTRACT

AIM: To Study the Demographic distribution of colloid goiter on USG-guided biopsy with free guided biopsy and confirm the same with cytohistopathological diagnosis.

INTRODUCTION: The reported incidence of thyroid nodules in children and adolescents is estimated to be between 1% and 2%. However, this incidence may be increasing because diagnostic radiological procedures are detecting incidental thyroid nodules in children and to find their correlation with histopathology.

MATERIAL AND METHODS: The study was conducted in a teaching hospital for a period of 1 year. It was a prospective hospital based Study. Patients were explained about whole of the procedure & the consent for the procedure was taken in all patients. FNAC of thyroid gland was done both free guided and ultrasonic- guided and the results were correlated statistically followed by histopathological examination wherever possible.

OBSERVATION: Out of 139 patients, maximum numbers of patients were in 31-40 age group i.e., 43 and minimum patients were in < 10 years and > 70 year age group. 24 patients were males and rest 115 were females. The diagnosis of thyroid lesions as per Bethesda System by USG and conventional FNAC. The distribution of benign lesions by USG guided FNAC was as: Colloid Goitre 51, and 49 by free guided biopsy. Histopathology was available only in 4 cases which yielded same results as that of cytology results. Out of 49 cases of Colloid goitre diagnosed on Free-hand FNAC, Histopathology was available only in 3 cases.

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CONCLUSION: In USG guided FNAC, Sensitivity was 96.96%, Specificity was 93.3%. Positive predictive value was 96.96%, Negative predictive value was 93.33% and Diagnostic accuracy was 95%. In Free Hand FNAC, Sensitivity was 90.0%, Specificity was 80.0%. Positive predictive value was 90.0%, Negative predictive value was 80% and Diagnostic accuracy was 86.66%.

KEY WORDS: Thyroid lesions, goiter, FNAC, ultrasonic-guided FNAC, histopathology

1. INTRODUCTION

In clinical practice Thyroid nodules are commonly encountered, with a prevalence of 2% to 5% for palpable thyroid nodules (Rojeski MT, 1985) and 19% to 46% for nodules detected by thyroid ultrasonography (Brander A et al; 1992). They are more common in women, and the incidence increases with age, history of radiation and diet containing goitrogenic material (Rojeski MT, 1985).

In developing countries where dietary iodine intake is low, Thyroid nodules are the most common endocrine disorders seen (Maheshwari V. et al; 2004). Clinically thyroid lesions present as goitre or thyroid enlargement which can be nodular (solitary or multiple) or diffuse (Mathur SR et al; 2005).

For evaluation of thyroid nodules, Clinicians have used clinical examination, biochemical lab., tests (T3, T4, TSH), transcutaneous ultrasonography, scintigraphy with (I-123 or Tc-99 m) and fine needle aspiration cytology (FNAC). FNAC has surpassed most of other tests (Jogai S et al; 2005).

The advancements in management of thyroid pathology has been possible, because of developments in the field of imaging radiology. Rapid evolution in sonographic technology has made ultrasound an important adjunct to the practice of head and neck surgery. Ultrasound of the neck is extremely sensitive in detecting thyroid pathology and is felt to be the most complete and cost-effective imaging method for the evaluation of the thyroid gland (Lew JJ et al; 2010).

Rizzato et al., in 1973, introduced USG guided-FNAC. Thereafter, several studies have reported that USG guided-FNAC reduces the inadequacy rate, helps to accurately select the patients for surgery, avoids unnecessary diagnostic thyroidectomies (Giorgio Rizzato et al; 2004).

Ultrasound guided-FNAC had a significantly higher rate of diagnostic accuracy compared to palpable FNAC (Ahmet Selcuk Can et al; 2008).

The reported incidence of thyroid nodules in children and adolescents is estimated to be between 1% and 2%. However, this incidence may be increasing because diagnostic radiological procedures are detecting incidental thyroid nodules in children (Izquierdo R et al; 2006).

The majority of thyroid fine needle aspiration Cytology (FNAC) is performed by palpation. Not infrequently, patients are sent to radiology for an ultrasound-guided FNAC. Real-time ultrasound FNAC allows for continuous visualization of the needle during insertion and sampling (Seiberling KA et al; 2008)

It is reported that 9 to 47% of palpation-guided and 4 to 21% of ultrasound-guided FNA smears are inadequate (Goudy SL et al; 2005). (Hatada et al; 1998) reported that for nodules less than 2 cm in diameter, the sensitivity and accuracy of USG-guided FNA biopsies are significantly better than manual FNA. (Mehrotra et al; 2005) reported an unsatisfactory specimen rate of 46.8% for palpation-guided FNAs and 15.6% for USG-guided core-cutting needle aspirations. From a large study with 9683 subjects, (Danese et al; 1998) reported the sensitivity, specificity and accuracy of palpation-guided thyroid FNAs as 91.8%, 68.8% and 70.9% and of USG-guided FNAs as 97.1%, 70.9% and 75.6%, respectively.

FNAC and USG are thus used in association with clinical features. The present study is undertaken to evaluate usefulness USG in managing thyroid nodules. USG guided FNAC of the thyroid is being performed as a special procedure in our department with the help of ENT and Radiology departments to diagnose various palpable and non palpable lesions.

Thus, there is a need of comparative study between conventional FNAC and USG guided FNAC and to find correlation with histopathology.

2. MATERIAL AND METHODOLOGY

The study was conducted in the Postgraduate Department of Pathology, in a tertiary institute. It was a prospective hospital based study in which FNAC of new cases of thyroid lesions was done. In each case, a brief clinical history and physical examination along with evaluation of relevant investigation was carried out. Fine Needle Aspiration Cytology of thyroid gland was done by Ultrasound guided. The radiologist and cyto-Pathologist carried out Ultrasound-guided FNAC. The slide smears were stained by May-Grunwald Giemsa (MGG) and Papanicolaou (PAP) staining method. The results of FNAC were correlated with histopathology, wherever available.

The Bethesda grading for reporting cytopathology

CATEGORY I **Non diagnostic /unsatisfactory smears:**

Smears containing few follicular cells or only blood without colloid were considered unsatisfactory or inadequate for diagnosis.

CATEGORY II **Smears negative for malignancy:**

The minimum criteria for calling a smear negative for malignancy was a total of six groups or clusters of well preserved benign appearing thyroid epithelial cells and a large quantity of colloid.

CATEGORY III **Atypia of undetermined significance:**

CATEGORY IV **Follicular Neoplasm:**

CATEGORY V **Smears suspicious for malignancy:**

The term suspicious /indeterminate was applied for follicular proliferation with minimal or no colloid and profuse presence of follicular cells and findings suggestive of, but not conclusive for malignancy. The distinction between follicular adenoma and follicular carcinoma was not possible on cytological grounds.

CATEGORY VI: **Smears positive for malignancy**

Histopathology

Method:

The cut specimen was kept in Fixative for 2-4 hours. The tissue blocks were thoroughly washed in distilled water, three to four times to remove Formalin. These tissues were dehydrated by passing through different grades of ethanol in ascending order. The specimens were embedded in molten wax, which was maintained in an oven at the melting point of the wax. Wax blocks of the embedded material were prepared by using 'L' blocks. The said blocks were marked and labeled for further processing. The sectioning of the Thyroid Specimen was done by rotary microtome. 3 to 5 microns thick sections were obtained. The staining was done routinely with Haematoxylin and Eosin. Mounting was done in Diphenyl Xylene. Microscopy was done under binocular microscope and characterization of various lesions was done. Microphotography was done. Correlation of the two methods was done by statistical evaluation using SPSS 11.5 software.

3. OBSERVATIONS

Table 1

Age Distribution of Patients of Study Sample

Age (yrs)	No. of Pts.	Percentage (%)
<10	1	0.72
11 to20	10	7.19
21 to 30	28	20.14
31 to 40	49	35.25
41 to 50	25	17.99
51 to 60	15	10.79
61 to 70	09	6.47
> 70	02	1.44
Total	139	100

The age distributions of the study cohort revealed that maximum number of patients were 43 in the 31-40 age groups. Minimum patients were in the less than 10 years as described in table 1.

Table 2

Demographic distribution of patients

Region	Number	Percentage
Urban	96	68.75
Rural	43	31.25

The patient demographic status was that maximum patients belonged to urban area 96 (68.75%) and remaining 43 (31.25%) were from rural area.

Table 3

Distribution of Benign lesions on USG-guided FNAC

AGE(yrs)	C.G.	OTHERS
<10	0	1

11-20	4	1
21-30	12	7
31-40	16	19
41-50	8	6
51-60	6	2
61-70	4	0
>70	1	0
Total	51	36

In the present study, ultrasound guided FNAC showed 87 non- neoplastic lesions, Colloid goitre was the most common accounting for 51 cases (67.61%). Cytological diagnosis of Colloid Goitre was present in 51(57.3%) cases in USG- guided FNAC and 49(54.44%) cases free hand FNAC. Age of the patients ranged from 18-70yrs with maximum number 16 (31.37%) in the age group of 31-40. Majority of the patients of colloid goitre were female accounting for 12 out of 13 and only one case was male.

Table 4

Age and Sex Distribution of Colloid Goiter on USG guided FNAC (n=51)

Age(yrs)	Male	Percentage	Female	Percentage
<10	0	0	0	0
11 to20	0	0	4	9.52
21 to 30	2	22.22	10	23.80
31 to 40	3	33.33	13	30.95
41 to 50	2	22.22	6	14.28
51 to 60	1	11.11	5	11.9
61 to 70	1	11.11	3	7.14
> 70	0	0	1	2.38
Total	9	100	42	100

In the present study, the cytologic diagnosis by ultrasound guided FNAC of colloid goitre was made in 51 cases (57.3 %). Majority of these patients were females numbering 42 (82.35 %) and 9 (17.65%) cases were males.

Table 5

Age and Sex Distribution of Colloid Goiter on Free hand FNAC (n=49)

Age(yrs)	Male	Percentage	Female	Percentage
<10	0	0	0	0
11 to20	1	11.11	2	5
21 to 30	2	22.22	10	25
31 to 40	3	33.33	11	27.5
41 to 50	2	22.22	6	15
51 to 60	1	11.11	6	15
61 to 70	0	0	4	10
> 70	0	0	1	2.5
Total	9	100	40	100

The cytologic diagnosis by Free Hand FNAC of colloid goitre was made in 49 cases (54.44 %). Majority of these patients were females numbering 40 (81.63 %) and 9(18.37 %) cases were males. Patient's age ranged from 10 to 80 years with maximum number of patients 25 (28.57%) in the age group of 31 – 40 years.

Comparison of diagnosis of colloid goitre by Free hand FNAC versus USG Guided FNAC is 48 cases were diagnosed in both USG guided and Free hand FNAC. 3 cases which were unsatisfactory in free hand FNAC was diagnosed as colloid goitre in USG guided FNAC. Histo-pathological study was available in 4 cases. Cytological diagnosis was confirmed in all 4 cases.

Table 6

Comparison of Benign lesions between USG-guided FNAC and Free-Hand FNAC

Thyroid lesion	USG-Guided FNAC	Percentage	Free- Hand FNAC	Percentage
Colloid goitre	51	57.30	49	54.44
OTHERS	39	42.70	41	45.56
TOTAL	90	100	90	100

Comparison of Non neoplastic lesions results both by USG guided FNAC and Free Hand FNAC in 89 patients shows difference of 3 cases in colloid goiter.

Table 7

Cytohistopathological correlation of Colloid goiter

Cytologic Diagnosis		Histopathological Diagnosis
Colloid Goitre		Colloid Goitre
USG-GUIDED FNAC	Free-hand FNAC	
04	03	04

Out of 51 cases of Colloid goitre diagnosed on USG-guided FNAC, Histopathology was available only in 4 cases which yielded same results as that of cytology results. Out of 49 cases of Colloid goitre diagnosed on Free-hand FNAC, Histopathology was available only in 3 cases.

Table 8

Statistical comparison between usg and free hand FNAC

VALUE	USG	FREE-HAND
Sensitivity	96.96%	90%
Specificity	93.3%	80%
Positive Predictive value	96.96%	90%
Negative Predictive value	93.33%	80%
Accuracy	95%	86.66%

In USG guided FNAC, Sensitivity was 96.96%, Specificity was 93.3%. Positive predictive value was 96.96%, Negative predictive value was 93.33% and Diagnostic accuracy was 95%. In Free Hand FNAC, Sensitivity was 90.0%, Specificity was 80.0%. Positive predictive value was 90.0% and Negative predictive value was 80% and Diagnostic accuracy was 86.66%.

4. DISCUSSION

The study was conducted in the Postgraduate Department of Pathology, in a tertiary institute. It was a prospective hospital-based study. In the present study Ultrasound guided and Free handed Fine needle aspiration was performed in 139 patients with thyroid swelling. The present study aimed at studying the Cytological features of Thyroid lesions by Ultrasound guided Fine needle aspiration and compared with Free-hand Fine needle aspiration. Furthermore, the cytological findings were confirmed with Histopathology examination (HPE), wherever it was available.

Fine needle aspiration cytology (FNAC) is the fundamental method for evaluation of thyroid nodules. Examination of the material obtained by FNAC enables to differentiate between benign and malignant lesions. However, FNAC of thyroid has its own limitations. Adequate cytologic interpretation depends on correct detection of the location of the suspected lesion and on the aspiration technique. Wrong detection and poor aspiration techniques cause most of the false negative reports. (A. Martinek et al; 2004)

Ultrasound guidance allows continuous visualization of the needle during insertion and sampling which results in pinpoint accuracy with a high level of safety. Ultrasound guided Fine needle aspiration cytology improves the yield of cancer detected at surgery (Carmeci C et al; 1998).

The present study has revealed some interesting data with respect to thyroid disease in the Jammu region of J & K State.

In the present study, age of the patients ranged from 5-79 yrs with a mean age of 38.5 years. According to (Dorairajan and Jayshree; 1996), majority (36%) of their patients were in the age group of 30-40 years, which is in conformity with our study in which maximum numbers of patients (30.94%) were from this age group. Age distribution and mean age of the present study was comparable to study but the mean age (A. Martinek et al; 2004) was lower when compared to (Hatada et al; 1998), (Nicholas J Screamton et al; 2003) and (Laurence et al; 1998).

In the present study majority were females numbering 110 whereas 29 were male, forming a male to female ratio of 1:3.79. Sex distribution, was comparable to study by (A. Martinek et al; 2004) and male patients were more in number compared to (Hatada et al ;1998), where as females are more in number compared to study by(Laurence et al; 1998) etc.

In the present study, fine needle aspiration of thyroid lesion results are interpreted as per Bethesda system

The results obtained by USG-guided FNAC of benign, malignant. Intermediate and Unsatisfactory subgroups, are incorporated in the following table and compared with results of studies by other authors.

Table 9

Comparison of results of present study with Other Authors

Cytological results	A Martinek et al.	AS Can et al	Present Study
Benign	4	147	87

Aspiration was done from at least 2-6 sites. (Laurie et al; 1996) stresses the importance of doing multiple aspirations as the thyroid can be affected by more than one disease process.

Aspirates done by Ultrasound guided FNAC were satisfactory for cytological evaluation in 135 cases and unsatisfactory in 4 cases where as aspirates done by conventional FNAC were satisfactory in 124 cases and unsatisfactory in 15 cases with the percentage of inadequate samples being 2.87 % and 10.79 % respectively. This when compared to study by (P Mehrotra et al; 2005) the percentage of inadequate samples is lower in both free hand and guided FNAC.

For considering the aspirate adequate for interpretation, it requires five to six groups of well preserved cells with each group consisting of 10 or more cells. Many studies have applied the same criteria for satisfactory aspirates. The presence of colloid is helpful for determining that the thyroid was sampled but without cells it is non-diagnostic (Laurie Mac Donald et al; 1996).

In present study, USG guided FNAC showed/diagnosed 87 smears as non-neoplastic 39 were neoplastic lesions and 4 were unsatisfactory. The non-neoplastic to neoplastic ratio was 2.23:1 by ultrasound guided FNAC. In conventional FNAC, 81 were non neoplastic lesions and 36 were neoplastic, 13 were unsatisfactory with non-neoplastic to neoplastic ratio being 2.25:1. Many authors have studied cytology of thyroid lesions with ratio of non neoplastic to neoplastic lesions ranging from 0.46:1 to 12.5:1. Ratio when compared to other studies it was comparable to (Erik K Alexander et al; 2002) study but non-neoplastic were higher in number of patients when compared to study by (A Martinek et al ;2004) and Antonello (Accurso et al; 2005)

In the present study, the most common lesion in ultrasound guided FNAC was Colloid goitre accounting for 51 cases.

Free hand FNAC showed similar picture with the most common non neoplastic lesion being Colloid Goitre 49. There were 15 unsatisfactory samples. Distribution of thyroid lesions when compared with studies by (A Martinek et al; 2004) was similar in colloid goiter

In the present study, Goitre was the commonest thyroid lesion accounting for 51(57.3%) by USG-guided FNAC. Similar observation was made by (A Martinek et al; 2004) who reported 156 (50.4%) out of 309 cases.

Histopathological study was possible in 4 cases of goitre which confirmed cyto-diagnosis in all the 04 cases.

The agreement between the USG guided FNAC and Free hand FNAC is highly significant shown by kappa k = 94 %.

The agreement between the USG guided FNAC and histopathology is shown by kappa k = 96 %.

The agreement between the Free hand FNAC and histopathology is shown by kappa k = 74 %.

5. CONCLUSION

The present study was conducted in the Post-graduate Department of Pathology. The present work comprised of:

- One year prospective analysis of thyroid lesions by USG-guided and conventional method fine needle aspiration cytology (FNAC).
- Correlation of findings of FNAC with Histopathological findings, wherever, available.

The study comprised of 139 patients of thyroid lesions who were subjected to USG-guided and conventional method fine needle aspiration cytology (FNAC). Following conclusions were inferred from the study:

1. Out of 139 patients, maximum numbers of patients were in 31-40 age group i.e., 43 and minimum patients were in < 10 years and > 70 year age group. 24 patients were males and rest 115 was females.
2. The diagnosis of thyroid lesions as per Bethesda System by USG and conventional FNAC was respectively ,as follows:
 - I. Unsatisfactory: 04, 15

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II. Benign:	87, 81
III. Atypia of undetermined significance:	none
IV. Follicular Neoplasm:	09, 07
V. Suspicious of malignancy:	none
VI. Malignant:	39, 36

3. The distribution of benign lesions by USG guided FNAC was as: Colloid Goitre 51, and 49 by free guided biopsy

4. Histopathology was available only in 4 cases which yielded same results as that of cytology results. Out of 49 cases of Colloid goitre diagnosed on Free-hand FNAC, Histopathology was available only in 3 cases.

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