

**Original Article****Diagnosing Malignancy by Fine Needle Aspiration Cytology in Cases of Solitary Thyroid Nodules**Bibek Ghimire<sup>\*1</sup>, Meenakshi Basnet<sup>1</sup>, Nischal Shrestha<sup>2</sup>, Satish Amatya<sup>1</sup>, Suju Bhattarai<sup>1</sup><sup>1</sup>Department of Otorhinolaryngology-Head and Neck Surgery, Nobel Medical College Teaching Hospital, Biratnagar, Nepal, <sup>2</sup>Department of Internal Medicine, Nobel Medical College Teaching Hospital, Biratnagar, NepalArticle Received: 01<sup>st</sup> March, 2022; Accepted: 20<sup>th</sup> June, 2022; Published: 30<sup>th</sup> June, 2022DOI: <https://doi.org/10.3126/jonmc.v11i1.45783>**Abstract****Background**

A solitary thyroid nodule is a discrete swelling that is palpable in apparently normal thyroid gland. It can be identified clinically as well as radiologically. This study aims to find the prevalence of malignancy in clinically detected solitary thyroid nodule and to compare the findings in pre-operative fine needle aspiration cytology test with post-operative histopathological examination to assess the accuracy of the test.

**Materials and Methods**

A descriptive cross sectional study was done in patients attending the Otorhinolaryngology outpatient department in our hospital from January to December 2021 with clinically diagnosed solitary thyroid nodules. Ethical approval was taken from the Institutional Review Committee of Nobel Medical College and Teaching Hospital. The collected data were collected in Microsoft Excel 2013 and was analyzed in Statistical Package for the Social Sciences version 21. Point estimate at 95% Confidence Interval and descriptive statistics were interpreted as frequency, percentage, or as mean and standard deviations.


**Results**

Among 37 patients with clinically detected solitary thyroid nodules, malignancy was found in 12 (32.43%) (17.35-47.51 at 95% Confidence Interval). The mean age of presentation was 34 ± 13 years with male female ratio of 1:8. Fine needle aspiration cytology had 64.00% sensitivity and 75.68% specificity in detecting benign lesions and 100% both in detecting malignancy.

**Conclusion**

The prevalence of malignancy by fine needle aspiration cytology among clinically detected solitary thyroid nodules was high as compared to other similar studies done in similar settings.

**Keywords:** *Diagnosis, Sensitivity and Specificity, Thyroid Nodule*

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## Introduction

A solitary thyroid nodule (STN) is a discrete swelling that is palpable in an apparently normal thyroid gland. Thyroid disorders most commonly manifest as a thyroid nodule. The prevalence is common among adults and is reported to be 4-7% of the general population which are usually benign with about 25% possibilities being malignant [1, 2]. Therefore, accurate evaluation of STN is pivotal. In most cases, clinically detected STN are found to be hyperplastic nodules in multinodular goiter [3].

Fine needle aspiration cytology (FNAC) is minimally invasive, cost-effective in diagnosing thyroid swelling. FNAC is useful in selecting patients for surgery and also a type of surgery is determined based on FNAC finding along with clinical examination [4].

The objective of this study is to find the prevalence of malignancy by FNAC among clinically detected solitary thyroid nodules and assessing the accuracy of FNAC by comparing with histopathology.

## Materials and Methods

A descriptive cross-sectional study was conducted in the department of Otorhinolaryngology and Head and Neck Surgery, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal over one year from January 2021 to December 2021 after taking ethical clearance from Institutional Review Committee. Patients with solitary thyroid nodule swelling, from the age group 17 to 60 years were selected for the study after taking informed consent. Patients unfit and unwilling for surgery were excluded. The sample size was calculated as 37 [using convenience sampling method formula  $n = Z^2pq/e^2$ , where  $n$  = minimum required sample size,  $Z = 1.96$  at 95% Confidence Interval (CI),  $p$  = prevalence of thyroid nodule taken as 5% [2],  $e$  = margin of error taken as 7%].

Cases selected for study were subjected to detail history, clinical examination, thyroid ultrasonography, thyroid function test. Solitary thyroid nodule of size >0.5 cm were subjected to pre-operative fine-needle aspiration cytology using fine needle aspiration cytology with aspiration technique. 22 gauge needle with 20ml syringe was introduced in the swelling and was gently moved to & fro. Simultaneously negative suction was created by withdrawing the piston. The aspirated material was expelled and smear was made on the slide. Then post-operative histopathology examination was done to correlate findings and assess the effectiveness of fine-needle aspiration cytology (FNAC).

Data was collected according to the proforma and entered in Excel and was analyzed by using SPSS software 21 version. Point estimate at 95% Confidence Interval and descriptive statistics were interpreted as frequency, percentage, or as mean and standard deviations.

## Results

Among 37 patients with clinically detected solitary thyroid nodules, malignancy was found in 12 (32.43%) (17.35-47.51 at 95% Confidence Interval). These 37 individuals were aged 17-60 years out of which females were 33 and males 4. The mean age of patients at the time of diagnosis was  $34 \pm 13$  years with the majority from age group 18-27 years (Table 1). No malignancy was seen in male while 21 (63.63%) female case was benign and 12 (36.36%) case was malignant by both FNAC and HPE (Figure 1). Malignancy was seen more common in age group 28-47 years (Table 2). In the FNAC, the majority of the cases 14 (37.83%) were colloid goiter followed by papillary carcinoma 8 (21.62%); follicular adenoma was observed in 7 (18.92%) cases, lymphocytic thyroiditis in 4 (10.81%), hürtle cell neoplasm in 3 (8.11%), and medullary carcinoma in 1 (2.70%). Post-operative histopathological correlation of 37 cases was done which showed follicular adenoma predominantly 14 (37.84%), followed by papillary carcinoma 8 (21.62%). One case was found to be hyperplastic nodule which was shown to be colloid goiter by FNAC. The prevalence of hürtle cell neoplasm, medullary carcinoma, and papillary carcinoma remained the same in both FNAC and HPE in our study (Figure 2).

**Table 1: Age distribution of study population**

Age Group (years)	Sex		No. of Cases	Percentage
	Female	Male		
≤17	1	0	1	2.7
18-27	12	2	14	37.8
28-37	7	2	9	24.3
38-47	5	0	5	13.5
≥48	8	0	8	21.6
Total	33	4	37	100

**Table 2: Age group wise FNAC and HPE findings**

Age group (years)	FNAC findings		HPE findings	
	Benign	Malignant	Benign	Malignant
≤17	1 (4.00%)	0 (0.00%)	1 (4.00%)	0 (0.00%)
18-27	12 (48.00%)	2 (16.66%)	12 (48.00%)	2 (16.66%)
28-37	5 (20.00%)	4 (33.33%)	5 (20.00%)	4 (33.33%)
38-47	1 (4.00%)	4 (33.33%)	1 (4.00%)	4 (33.33%)
≥48	6 (24.00%)	2 (16.67%)	6 (24.00%)	2 (16.67%)
Total	25 (67.56%)	12 (32.43%)	25 (67.56%)	12 (32.43%)



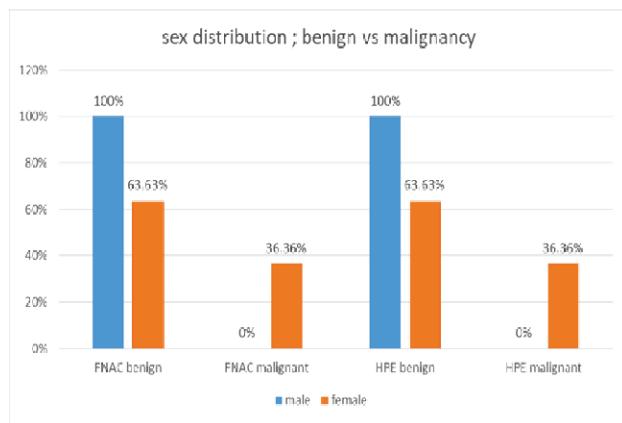


Figure 1: FNAC and HPE findings gender wise

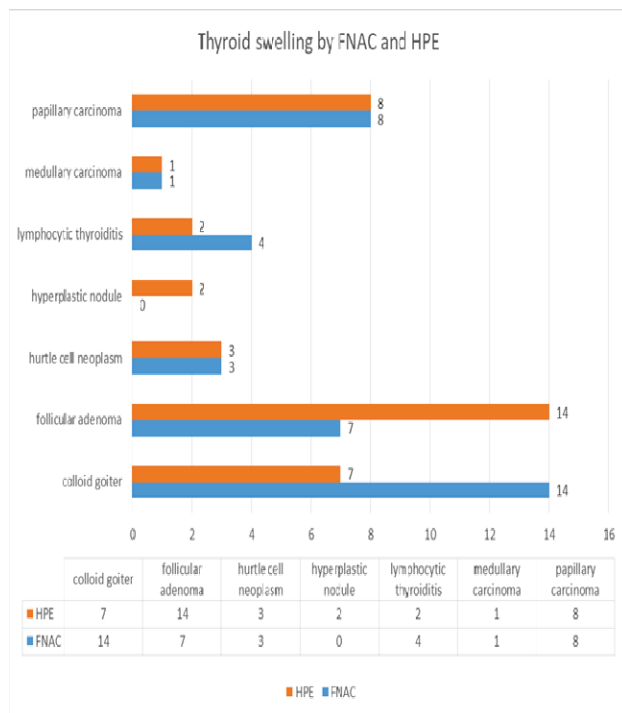


Figure 2: Comparison between FNAC and HPE findings

True positive (TP) and true negative (TN) determines those cases which are diagnosed correctly as malignant and benign respectively. False-positive (FP) cases consist of those cases which are benign but wrongly diagnosed as benign (Table 4).

Table 4: Correlation of FNAC and HPE in detecting malignant nature of thyroid swelling

FNAC diagnosis	HPE diagnosis		Total
	Malignant	Benign	
Positive	12 (True positive)	0 (False positive)	12
Negative	0 (False negative)	25 (True negative)	25
Total	12	25	37

Sensitivity for malignancy =  $12 / (12+0) \times 100 = 100\%$   
 Specificity for malignancy =  $25 / (0+25) \times 100 = 100\%$   
 Accuracy for diagnosing malignancy =  $(12+ 25) / (12+0+0+25) \times 100\% = 100\%$

Table 5: Correlation of FNAC and HPE in detecting benign nature of thyroid swelling  
 Sensitivity for benign =  $16 / (9+16) \times 100 = 64\%$

FNAC diagnosis	HPE diagnosis		Total
	Benign	Malignant	
Negative	16 (True positive)	9 (False positive)	25
Total	25	12 (True negative)	37

Specificity for benign =  $12 / (0+12) \times 100 = 100\%$   
 Accuracy for diagnosing benign lesion =  $(16 + 12) / (16+9+0+12) \times 100\% = 75.68\%$   
 This study showed accuracy of FNAC 75.68% with 64% sensitivity and 100% specificity in the diagnosis of benign solitary thyroid nodules whereas, 100% accuracy with 100% sensitivity and specificity in the diagnosis of malignancy in solitary thyroid nodules.

Discussion

Thyroid gland malignancy is the most common malignancy of the endocrine gland system and accounts for approx. 1% of all cancers [5]. Five year survival rate has increased to 98.3% because most of the cases are diagnosed at an early stage when the cancer is localized at the gland [6]. Martin and Ellis in the 1930s made the first cytological diagnosis with FNAC [7]. At present, FNAC is the first-line diagnostic test for the evaluation of thyroid nodules. FNAC is a minimally invasive, cost-effective test and has high diagnostic value [8]. The main purpose of FNAC is to rule out the possibility of malignancy. FNAC prevents unnecessary surgical intervention in cases of benign thyroid nodules. A study reported that the use of FNAC resulted in a decrease in the number of patients who underwent surgical treatment by 25-50% [9].

In this study, most of the patients are females (89.19%) with 18-27 years age patients affected more commonly (37.8%). This is similar to studies that reported solitary thyroid nodule is more common in the adult age group and females more than males; however, the incidence of malignancy is more in men [1, 2, 10, 11]. The chances of thyroid nodule formation is high in female is related to changes in estrogen and progesterone level during various phases (puberty, menstrual cycles, pregnancy, and menopause) of their life cycles [2, 12]. In this study malignancy in males was not established which is in contrast to the study done by Nasr et al which showed high malignancy that is 44.44% in males compared to 25% in females [1]. Such zero prevalence of malignancy among males in this study might be due to inadequate sampling. The sensitivity and specificity of FNAC in



diagnosing malignancy came out 100% each in this study which is in contrast to the study by Saddique et al which showed 75% sensitivity and 95.83% specificity [13]. Hamburger et al reported that FNAC of thyroid nodules have sensitivity from 65-98% and specificity from 72-100% [14]. Out of 37 cases, histopathology was available in all cases and correlated with the cytological diagnosis. In the present study, out of 37 cases, benign lesions were 67.56% of which colloid goiter was 37.83%, malignant lesions were 32.43% of which papillary carcinoma was 21.62%. Malignancy prevalence among clinically detected cases of solitary thyroid nodules is comparable to that of 37.50% by Sarita [15] but more than that in studies by Nasr B et al, Kavya et al which showed 25% and 23.3% respectively [1,2]. Small sample size and being a single centered study were the limitations of the study and therefore the results cannot be generalized to the whole population.

### Conclusion

The prevalence of malignancy by fine needle aspiration cytology among clinically detected solitary thyroid nodules was high as compared to other similar studies done in similar settings.

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**Conflict of interest:** None

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