

## Cytological correlation of spectrum of head and neck lesions with epidemiological and diagnostic parameters

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### Abstract

**Background:** Fine Needle Aspiration Cytology (FNAC) has many advantages and utilities in cervical region. Most of the studies documented in the literature regarding head and neck masses, either describe spectrum of lesions or etiological causes. The studies in the past have also tried to associate the FNAC procedure with statistic parameters such as sensitivity, specificity and predictive values / diagnostic accuracy. However, in the present study an attempt was made to correlate the etiological (diagnostic) and site-specific need of doing a FNAC procedure with epidemiological parameters such as age specific sub groups and sex parameters.

**Materials and Methods:** 1708 cases of head and neck swellings reporting for FNAC to the Department of Pathology, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India over a period of three years (January 2012 - December 2014) were included in the study. The final diagnosis with other epidemiological, anatomical and clinical history was obtained from the requisition forms and the final reports filed in the archives of the department. Statistics employed included central distribution parameters such as mean, median and averages. Chi-Square ( $\chi^2$ ) test and Fischer's exact test were employed to analyze and investigate for significance of the cytological diagnosis with epidemiological and anatomical parameters.

**Results:** The most common age group varied from 20-50 years with M:F ratio being 0.7:1. Overall reactive lymphadenitis and lymph nodes were the commonest cause and site for patients to undergo FNAC for swellings of head and neck region. Thyroid, skin and soft tissue lesions were the next commonest sites (36.29% and 19.33% respectively). Across the board, inflammatory pathologies were the commonest lesion reported (66.56%). Statistically it was found that there was significant difference between type of lesion according to the anatomical site (p value= 0.001) and the difference was not attributable to the more number of cases of lymph nodes itself.

Statistically, for age specific rates there was a strong association between the type of lymph node lesion with the age specific sub groups (p value= 0.0005) and sex (p value= 0.012). Also noted was a strong association between the type of lymph node malignancy and the age group (p value= 0.002) Interesting point was an equal distribution of NHL over the spectrum with almost equal cases seen in children, young adults and early elderly. This again was found to be statistically significant. There was a strong association between the type of thyroid lesions and the age group but no association was seen between the type of thyroid lesion and either the sex or age specific groups of the subjects.

**Conclusion:** The study concludes that there was significant difference between type of lesion according to the anatomical site. In case of lymph nodes there was a definitive association between the age group and sex of the patient with the ultimate diagnosis rendered. Hence age groups and the sex does play a definitive role in predicting the type of lesion; more so in lymphoid tissue of the head and neck region. There was significant statistical association of the type of lymphoid malignancy with the age and sex. The similar findings were not derived in the rest of the organ systems such as thyroid, salivary glands and skin/ soft tissue lesions.

**Keywords:** Age Specific, Cytology, Head and Neck, Spectrum, Sex, Site

### Introduction

In the head and neck region, cervical masses are the commonest complaints encountered in surgical and otorhinolaryngology outpatient practices and often are diagnostically challenging.<sup>(1,2)</sup> The various etiopathologies encountered are related to lymph nodes, thyroid, salivary glands, skin and soft tissue lesions including metastatic deposits from primary of various regions. In this context, Fine Needle Aspiration Cytology (FNAC) has many advantages and utilities in cervical region. Firstly, it is a simple, quick and cost effective method, performed in the outpatient department with minimal trauma. Secondly, especially in cystic swellings it can be both diagnostic and therapeutic. Thirdly, FNAC is particularly helpful in the work-up of cervical masses and nodules as it gives a

good yield of material and as such biopsy of cervical swelling should be avoided unless all other diagnostic modalities have failed to establish a diagnosis.<sup>(3,4)</sup> This is important as early differentiation of benign from malignant pathology is beneficial as it greatly influences the planned treatment. FNAC does not give the same architectural detail as histology but it can provide cells from the entire lesion as many passes through the lesion can be made while aspirating. The objectives of the present study was to assess the frequency of lesions at different sites of head and neck region, its incidence amongst two sex groups, the spectrum of distribution of head and neck lesions classifying them as inflammatory, non-neoplastic or neoplastic and lastly, to statistically calculate the significance of various epidemiological, anatomical

parameters with the cytological/pathological diagnosis.

### Materials and Methods

Patients of head and neck swellings reporting for FNAC to the Department of Pathology Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India over a period of three years (January 2012 - December 2014) were included in the study. The final diagnosis in all the cases were made on cytology which were corroborated with clinical and radiological findings with other epidemiological, anatomical and clinical history obtained from the requisition forms and the final reports filed in the archives of the department.

**Exclusion Criteria:** Cases diagnosed as non-diagnostic/ descriptive, having multiple differentials or pauci-cellular were not included in the study.

**Statistics:** The results thus obtained were tabulated as descriptive studies as per age, sex, benign, malignant and inflammatory pathology. Statistics employed included central distribution parameters such as mean, median and averages. Chi-Square ( $\chi^2$ ) test and Fischer's exact test were employed. P values were calculated to analyze and investigate for significance of the cytological diagnosis with epidemiological and anatomical parameters including differentiation between benign and malignant neoplasia. A p value less

than 0.05 was considered to be statistically significant.

### Results

**General Observations:** A total of 1708 cases were included in the present study. The age ranged from 1 to 90 years with the most common age group varied from 20-50 years. Females outnumbered males with M:F ratio being 0.7:1 (949 i.e. 55.56% were females and 759 i.e. 44.43% were males).

Overall, reactive lymphadenitis was the commonest cause for patients to undergo FNAC for swellings of head and neck region with lymph node being the commonest organ system involved accounting for 37.64% of cases followed by thyroid and skin and soft tissue lesion (36.29% and 19.33% respectively). (Fig. 1)

Across the board, inflammatory pathologies were the commonest lesion reported (66.56%) followed by benign and malignant lesions. Tuberculosis was the least common etiological factor accounting for FNAC (2.10%).

Statistically it was found that there was significant difference between type of lesion according to the anatomical site (p value= 0.001) and the difference was not attributable to the more number of cases of lymph nodes itself. (Table 1)

**Table 1: Frequency of head and neck lesions according to site**

	Inflammation/ reactive	TB	Malignancy	Benign	Total
Lymph Node	520	28	95	0	643
Thyroid	368	0	21	231	620
Skin and soft tissue	175	8	50	97	330
Salivary Gland	51	0	11	27	89
MiscellaNeous	23	0	0	3	26
Total	1137	36	177	358	1708

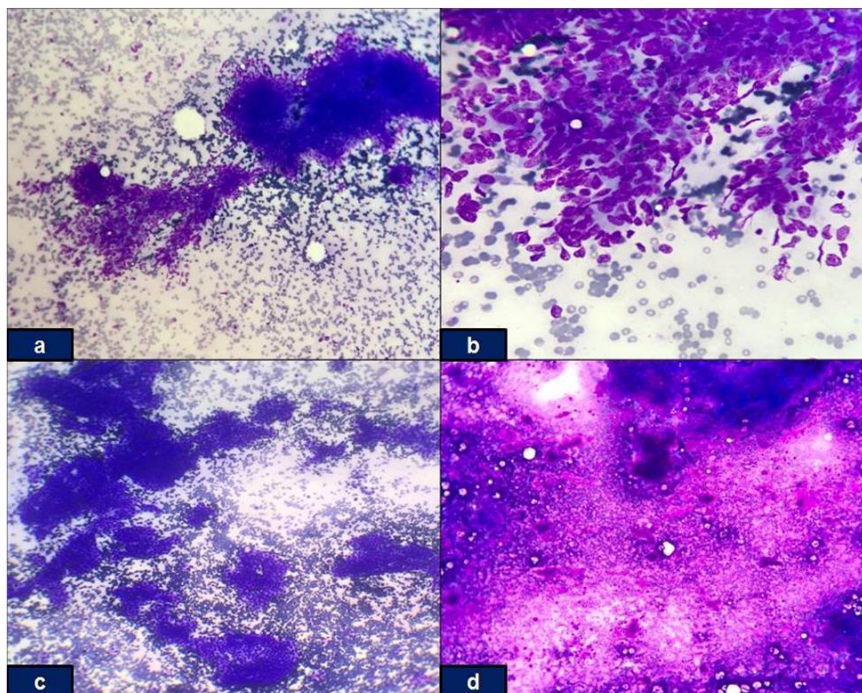
### Lymph Node

**Epidemiological Parameters and Statistics:** Males outnumbered females in most lesions except in tuberculosis where reverse was noted. Majority of the cases of lymph node masses were noted in the age group of 20-30 years with maximum lymphoid malignancies noted in the age group 40-50. In contrast the inflammatory conditions were recorded in younger age group 20-30 years.

Statistically, for both age specific rates and sex difference; there was a strong association between the type of lymph node lesion and the age group (p value= 0.0005) and sex of the subject (p value= 0.012). (Table 2)

**Table 2: Spectrum of lymph node lesions-according to etiology, age-group and sex ratio**

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total	M:F Ratio
Inflammation	82	83	96	84	61	54	37	21	2	520	1.13:1
Tuberculosis	1	11	8	3	2	3	0	0	0	28	0.55:1
Malignant	5	4	12	16	20	13	16	6	3	95	1.87:1
Total	88	98	116	103	83	70	53	27	5	643	1.17:1



**Fig. 1:** a) Tumor cells of squamous cell carcinoma metastasizing to lymphnode. (MGG, 200X), b) High power view of the same. (MGG, 400X), c) Complex papillary structures in a case of papillary carcinoma thyroid. (MGG, 100X), d) Epithelial and myoepithelial cells emashed in metachromatic stained fibrillary ground substance. (MGG, 100X)

**Diagnostic Parameters and Statistics:** While most common reason for lymph node aspiration was reactive lymphadenitis recorded in 520 (80.87%) cases; the malignancy was noted in 95 (14.77%) cases only. Of the lymph node malignancies, secondary carcinomatous deposits with 63 (66.31%) cases was the commonest reason for aspiration followed by Non hodgkin's lymphoma in 23 (24.21%) cases with Hodgkin's lymphoma (9 cases; 9.47%) being the least common etiology noted in present study.

On applying statistics to comment upon the

association of lymphoid malignancies of the head and neck region and age specific rates it was seen that there was a strong association between the type of lymph node malignancy and the age group (p value= 0.002) with secondary deposits most commonly seen in 60-70 years age group and was found to be statistically significant. Interesting point was an equal distribution of NHL over the spectrum with almost equal cases seen in children, young adults and early elderly. This again was found to be statistically significant. (Table 3)

**Table 3: Spectrum of lymphoid malignancies according to age group**

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total
Non Hodgkin's Lymphoma	4	3	4	3	4	2	0	3	0	23
Hodgkin's Lymphoma	1	1	3	2	1	1	0	0	0	9
Secondary Carcinomatous Deposits	0	0	5	11	15	10	16	3	3	63
Total	5	4	12	16	20	13	16	6	3	95

### Thyroid

**Epidemiological Parameters and Statistics:** Most of the cases of thyroid swellings were noted in age group of 30-40 years with females outnumbering males in almost all categories. While inflammatory pathologies were noted in a younger age group (20-30 years); thyroid malignancies were seen in middle-aged individuals (30-40 years). In contrast to the findings recorded in lymph nodes; benign lesions were most common in elderly age group (60-70 years). This finding was found to be statistically significant (p value = <0.000001) with thus a strong association between the type of thyroid lesions and the age group. However; there was no association between the type of

thyroid lesion and the sex of the subjects. (Table 4)

**Table 4: Spectrum of thyroid lesions-according to etiology, age group and sex ratio**

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total	M:F Ratio
Inflammation	0	6	122	115	108	10	7	0	0	368	0.44:1
Benign	7	43	8	19	14	81	48	8	3	231	0.40:1
Malignant	0	2	1	6	5	3	4	0	0	21	0.23:1
Total	7	51	131	140	127	94	59	8	3	620	0.39:1

**Diagnostic Parameters and Statistics:** Most common reason for thyroid FNAs was inflammatory/ reactive pathology seen in 368 (59.35%) cases. While benign thyroid lesions accounted for 231 (37.25%) cases of all the thyroid lesions, the malignant counterparts were noted in 21 (3.38%) cases only. Of the thyroid malignancies, follicular carcinoma with 14 (66.66%) cases was the commonest reason for aspiration followed by medullary and papillary carcinoma (19.04% and 14.28% respectively). However, no significant association was elicited between age specific group and type of thyroid malignancy. (Table 5)

**Table 5: Spectrum of thyroid malignancies-according to age group**

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Total
Medullary Carcinoma	0	0	0	1	1	1	1	0	0	4
Follicular Carcinoma	0	1	1	4	4	1	3	0	0	14
Papillary Carcinoma	0	1	0	1	0	1	0	0	0	3
Total	0	2	1	6	5	3	4	0	0	21

### Salivary gland

**Epidemiological Parameters and Statistics:** Barring the benign lesions, in rest of the categories of salivary gland pathologies males outnumbered females with most of the cases noted in age group of 50-60 years. While the inflammatory pathologies were noted in younger age group of 20-30 years, the benign salivary gland lesions were common in the age group of 30-40 years with malignancies recorded in elderly (60-70 years).

On employing chi-square, no significant association between the age groups and sex of the subject with the type of salivary gland lesion was found.

**Diagnostic Parameters and Statistics:** Similar to the findings recorded at other anatomical regions, the inflammatory causes were most common etiology accounting for more than half of the cases (57.30%) aspirated at this site followed by benign lesions (30.33%) and malignant neoplasia (12.35%) cases.

Of the salivary gland malignancies secondary carcinomatous deposits 6 (54.54%) cases were the commonest reason for aspiration followed by mucoepidermoid and acinic cell carcinoma (27.27% and 18.18% respectively). However, no statistical significance was elicited between the age specific groups and type of malignant salivary gland neoplasm.

**Skin and Soft Tissue:** Most common etiological factor in this region also was inflammatory pathology (67.57%), followed by malignant and benign lesions respectively (15.15% and 14.84%) Tubercular pathologies accounted for 2.42% cases only. Of the skin

and soft tissue malignancies squamous cell carcinoma with 45 (90%) cases were the commonest etiological factor followed by cutaneous non hodgkin's lymphoma (3 cases; 6%) and malignant spindle cell tumors (2 cases; 4%).

No statistical association between epidemiological and diagnostic parameters could be elicited as the individual entities in age sub groups were less per decade although overall number was more.

### Discussion

In the present study the commonest age group undergoing the FNAC for the head and neck lesions was 20-50 years with surprisingly females outnumbering male by a ratio of 0.7:1. The findings of studies done elsewhere although corroborate with findings of the study conducted with young adult age group (20-30 years) being the largest cohort but in most studies male preponderance is documented.<sup>(5,6)</sup> Overall lymph node swelling was the commonest reason for FNAC with inflammatory reasons being the commonest etiology followed by benign and malignant lesions. The study comprehensively prove by means of statistical analysis that there was significant difference between type of lesion according to the anatomical site (p value= 0.001). Other studies although have found lymph node masses to be the most common reason for the head and neck FNAC but no study has tried to document this relationship statistically.<sup>(7)</sup>

Lymph node FNAC is possibly the most discussed and dissected topic in the setting of head and neck FNAC and its role has been well established.<sup>(8)</sup> The

usefulness of the procedure in the setting of FNAC for differentiating reactive lymphadenitis from lympho-proliferative lesion and there by its role in diagnosis and eventual staging and therapeutics are also well documented. However; the association of the nature of lesion with age specific groups has not been very well documented. In the present study conducted it was statistically proven that the likely hood of a mass in lymph node eventually turning out to be malignant if presenting in an elderly age group of 50-60 years was very likely and to have an inflammatory etiology in a younger age group. This can thus have a bearing on the eventual importance of clinically judging the neoplastic/reactive etiology of lymphadenopathy according to the specific age groups by the treating physician.

The finding of inflammatory pathology as the commonest etiological factor is also corroborated by studies done in India and elsewhere.<sup>(9)</sup> Although there are reports of malignancies as the commonest cause of lymph node masses by some institutes such as the one conducted by Anila KR done in south India where metastatic deposits were the commonest cause of lymph node masses (seen in 45% of all 2000 cases included in the study).<sup>(10)</sup> Most of the studies have also found it to be a very good tool for identifying true negatives and having almost 100% diagnostic accuracy.<sup>(8)</sup>

Thyroid FNAC represents a valuable/feasible tool. The role of thyroid FNAC has seen a radical change with introduction of Bethesda system of reporting thyroid malignancies with stress upon the reporting according to the categories as it has a direct bearing in the eventual prognosis of the patients with thyroid neoplasm.<sup>(11,12)</sup> In the present study unlike the lymph node malignancy, the commonest age group suffering from thyroid malignancies was 30-40 years with more benign lesions seen in the older age group of 60-70 years. This fact which was statistically found significant again can be an important pointer for an endocrinologist to be vigorous with investigative protocols for thyroid swellings presenting in 3<sup>rd</sup> and 4<sup>th</sup> decade.

The finding of inflammatory/benign etiologies to be the commonest cause of thyroid swelling is also documented in the literature, which abounds with this in various geographical parts of the world.<sup>(13)</sup> The commonest thyroid malignancy in our study was follicular carcinoma with very few cases of papillary carcinoma is in contrast with the studies done in Sub Saharan Africa where papillary carcinoma now stands to be the commonest thyroid malignancy owing to the rigorous iodization programmes.<sup>(14)</sup> Statistically however; no association could be attributable for an increase or decrease of the age with the specific thyroid malignancies in the present study.

FNAC has also been universally accepted as a reliable and a safe method for diagnosis of salivary gland lesions. Over the years it has been proven to be a tool for accurate diagnosis in salivary gland pathology

with good statistics backing up the procedure regarding sensitivity, specificity and diagnostic accuracy.<sup>(15)</sup>

In the present study, males outnumbered females except in benign conditions where reverse was noted. Also inflammatory conditions were the commonest reason for the aspirate with pleomorphic adenoma being the commonest benign lesion. This is also recapitulated by work done by many researchers who have concluded the same.<sup>(16,17)</sup>

The finding of most common malignant neoplasm as a primary salivary gland tumour varies according to the different studies with muco-epidermoid or adenoid cystic ruling the roost in most of the studies.<sup>(18,19)</sup> In our study however, secondary carcinomatous deposits came out to be the most common cause of salivary gland malignancies, which was highly unusual. The reason could be the small number of cases included in the study conducted leading to this finding. The small sample size could also be the reason of non-significant statistical association of age group and sex for type and etiology of the salivary gland lesions.

For most of the last century and start of the present, incisional or core biopsies were recommended to reach a conclusive diagnosis in soft tissue lesions but advent of usage of FNAC as a minimally invasive diagnostic procedure has been gaining acceptance day by day.<sup>(20)</sup> The diagnostic yield of the material by many studies has been found to be equal to the trucut biopsies but it still suffers from some limitations in the form of inability to comprehensively differentiate between low grade sarcomas and the benign proliferative/cellular or borderline lesions especially in the mesenchymal lesions of spindle cell in origin. In all such cases histology still remains the gold standard.<sup>(21)</sup>

In the present study the most common cause for skin and soft tissue FNAC was inflammatory pathology followed by benign pathologies and malignancies in which squamous carcinomas were the most common etiological factor. This is in contrast with the work done by many researchers who have found that the malignant neoplasm constitute major reason for soft tissue FNAC.<sup>(22)</sup>

## Conclusion

Most of the studies documented in the literature regarding head and neck masses are either individualized according to the site specific (deals with individual organ system) or a generalized etiological commentary (spectrum based). The studies in past have also tried to associate the FNAC procedure with statistic parameters such as sensitivity, specificity and predictive values / diagnostic accuracy. However; in the present study we have tried to correlate the etiological and site-specific need of doing a FNAC procedure with epidemiological parameters such as age specific sub groups and sex parameters.

The study concludes that there was significant difference between type of lesion according to the

anatomical site. In case of lymph nodes there was a definitive association between the age group and sex of the patient with the ultimate diagnosis rendered. There was significant statistical association of the type of lymphoid malignancy with the age and sex. The similar findings were not derived in the rest of the organ systems such as thyroid, salivary glands and skin/ soft tissue lesions. Hence, age groups and the sex does play a definitive role in predicting the type of lesion; more so in lymphoid tissue of the head and neck region.

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