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Original Article

Observation on Clinico-pathological and radiological findings of head and neck swellings in a tertiary care centre

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Abstract:

Introduction: *Head and neck swellings have a wide range of causes, appearances, and behaviours. Developing a diagnostic plan for their accurate management is crucial. This requires a thorough understanding. Therefore, this study aimed to describe the clinicopathological profile of various head and neck swellings in a tertiary care center.*

Materials and Methods: *This prospective descriptive study was conducted on 190 patients at a tertiary care center in Northern India. After a detailed workup, clinical, USG and FNAC findings were documented and patients were managed medically or surgically. The findings were then correlated with the final HPE report.*

Results: *Of the 190 patients, 139 (73.2%) had non-neoplastic swellings, 21 (11.1%) had benign neoplasms, and 30 (15.7%) had malignant lesions. Neck swellings accounted for 71.6% (n=136), with the majority being thyroid swellings (47.1%) and lymphadenopathy (26.4%). Head swellings comprised 28.4% (n=54), predominantly involving the parotid gland (25.9%) and post-traumatic nasal swellings (9.3%). The most common etiology was infective or inflammatory (55.2%).*

Conclusion: *A systematic approach is essential for determining a preliminary diagnosis, considering potential alternative diagnoses, and devising an appropriate treatment plan for patients with palpable masses.*

Keywords: *Facial swelling, Ultrasound (USG), Fine needle aspiration (FNAC),Head and Neck Neoplasm, Histo-pathology (HPE), Thyroid neoplasms, Salivary Gland Diseases, Lymph Node, Post-trauma*

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in a tertiary care centre

Introduction:

Neck swellings can be classified in relation to the triangles of the neck. The various triangles of the neck are anterior, digastric, carotid, muscular, and posterior. The anatomical knowledge of these triangles is very important for understanding the differential diagnosis of various pathologies presenting as neck swellings[1]. Neoplastic lesions of the neck region make an important differential diagnosis and have a high prevalence rate in India, which may be attributed to low socioeconomic conditions along with poor dental hygiene and imbalanced dietary habits, tobacco use, alcohol consumption and viral infections[2].

For diagnosing a neck swelling, a rigorous clinical evaluation is required that may be accompanied by sophisticated diagnostic techniques to achieve firm evidence and certainty about the type and origin of the swelling, such as the use of imaging or pathological investigations like FNAC/biopsy to confirm a case of recurrent neck mass[3]. A good clinical, radiological and cytological correlation is a must to plan an effective surgical intervention[4,5].

Since there are very few studies in the literature on the clinico-radio-pathological analysis of neck swellings, the present study was conducted to evaluate the etiopathogenesis and clinical profile of neck swellings in detail.

Materials and methods:

This prospective study was conducted on 190 patients in the Department of Otorhinolaryngology of a tertiary care center after approval by the Institutional Ethical Committee and after obtaining informed consent from all patients. The study was conducted from January 2023 to July 2024.

Inclusion criteria were:

1. All patients presenting with a head and neck swelling were included in the study.
2. All patients consenting to be a part of the study were included in the study.

Exclusion criteria were:

1. Patients who did not give consent for Radiological / FNAC investigations.
2. Patients with insufficient or incomplete data

All the cases were subjected to a detailed clinical work-up. Relevant history of the patient was obtained and a meticulous clinical examination of the swelling was done.A tentative clinical diagnosis was made.

Fine needle aspiration cytology of swellings was done with all aseptic precautions in the pathology department. Thyroid swellings were graded as per Bethesda System of reporting Thyroid Cytopathology (TBSRTC). Ultrasono-graphy neck was done using 5-13MHz linear probe and details were noted. Thyroid swellings were classified according to TIRADS scoring. CECT neck was done wherever necessary. Appropriate surgical or medical management was undertaken in accordance with the probable diagnosis. All the findings were documented.All patients were advised to follow up as per the pathological diagnosis.

Statistical analysis: Data were described in terms of mean ± standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. Sensitivity, specificity, accuracy, positive predictive value, and negative predictive value were also calculated. All statistical

calculations were done using SPSS (Statistical Package for the Social Sciences,version21, SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Results:

A total of 190 patients were included in the study. The majority of patients belonged to the age 31 -40years(67,35.2%),followed by 21-30years (46,24%) (Table 1). The mean age of study participants was 36.20 (±17.58) years.107 (56.3%) out of 190 study participants were females, comprising the majority, while the study included 83 (43.6%) males. In our study, the male:female ratio was found to be 1: 1.28.

139 head and neck swellings out of 190 were non-neoplastic while 21 were benign neoplastic masses and 30 were malignant neoplastic masses.The non-neoplastic masses comprised the majority in all age groups. Malignancy was not seen in people below 30 years of age in the study participants. (**Table 1).** The majority of study participants in both genders had a non-neoplastic mass. Among non-neoplastic masses, females comprised 57.5% and males 42.4%. Among benign masses, 61.9% were females and 38% were males; while 46.6% of malignant masses were females and 53.3% were males.

Table-II shows the distribution of head and neck swellings according to the site in our study. The site of involvement in the head was parotid swellings (25.9%), followed by post-traumatic swellings of the nose (9.25%).Most study participants with neck swellings had thyroid involvement (47.05%), while 26.4% had enlarged lymph nodes. 18.38 % presented with skin and soft tissue lesions and 5.8% involved the submandibular gland. **Figure 1** shows a repertoire of swellings of different subsites of the head and neck.

Table-I:

Age wise distribution of non-neoplastic and neoplastic mass

Variable	Non Neoplastic	Neoplastic		Total
		Benign	Malignant	
Age				
0 -10 years	5(3.5%)	0(0%)	0(0%)	5(2.6%)
11-20 years	20 (14.3%)	1(4.7%)	0(0%)	21 (11%)
21-30 years	46 (33%)	0(0%)	0(0%)	46 (24%)
31-40 years	42 (30.2%)	11 (52%)	14 (46.6%)	67 (35.2%)
41-50 years	17 (12.2%)	7((33%)	13 (43.3%)	37 (19.4%)
51-60 years	7(5%)	1(4.7%)	1(3.3%)	9(4.7%)
61-70 years	1(0.7%)	1(4.7%)	1(3.3%)	3(1.5%)
71-80 years	1(0.7%)	0(0%)	1(3.3%)	2(1%)

Table II :

Distribution of study participants according to the site of involvement in Head and Neck swellings

Site of of swellings	Frequency	Percentage of the subgroup: head or neck	Percentage of Total
HEAD (n=54;100%)			
Scalp/ Forehead			
Lipoma	2	3.7%	1.05%
Sebaceouscyst	1	1.8%	0.52%
Eye			
Dacrocystocele / Dacrocystopyocele	3	5.5%	1.57%
Nodular Basal cell carcinoma of lower eyelid	1	1.8%	0.52%
Nose			
Neurofibromatosis	1	1.8%	0.52%
Furunculosis	2	3.7%	1.05%
Post trauma	5	9.25%	2.63%
Ear			
Preauricular - Infected Preauricular sinus	4	7.4%	2.10%
- hemangioma	1	1.8%	0.52%
- Parotid (all masses)	14	25.9%	7.36%
Pinna – Keloid	4	7.4%	2.10%
-Seroma	2	3.7%	1.05%
Post aural – Infected lymph nodes	2	3.7%	1.05%
-Subperiosteal abscess	4	7.4%	2.10%
Lip			
Keratinous horn	1	1.8%	0.52%
Mucus retention cyst	2	3.7%	1.05%
Cheek			
Nasolabial cyst	2	3.7%	1.05%
Spindle cell tumor	1	1.8%	0.52%
Total	54	100%	28.42%
NECK (n=136;100%)			
Thyroid gland	64	47.05%	33.68%
Lymph node	36	26.4%	18.94%
Submandibular gland	8	5.8%	4.21%
Sublingual gland	1	0.73%	0.52%
Skin and soft tissue lesion (e.g. Lipoma, sebaceous cyst,etc)	25	18.38%	13.15%
Vascular – Carotid body tumor	1	0.73%	0.52%
Nerves – Schwanomma	1	0.73%	0.52%
Total	136	100%	71.57%

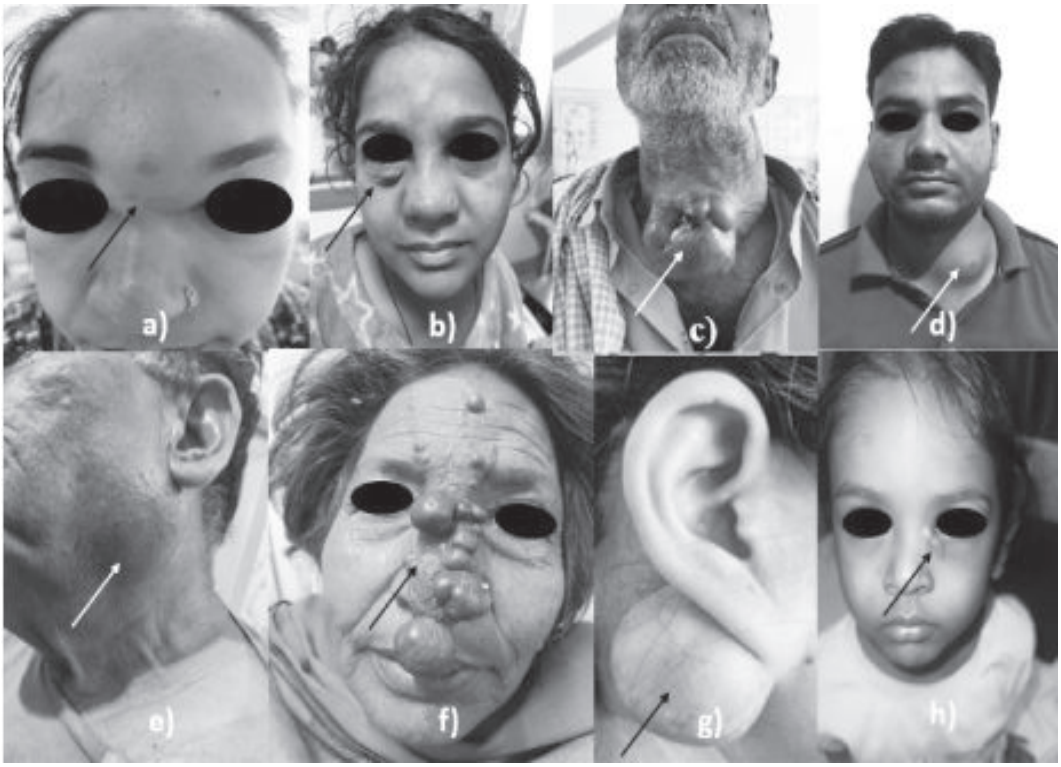

Figure 1: Clinical Photograph of various subsites of the head and neck

a) Lipoma of the forehead in an adult female

b) Nodular Basal cell carcinoma of the right lower eyelid

c) Anaplastic carcinoma of the thyroid with skininfiltration

d) Cold abscess of left side Level IV lymph node

e) Left Warthin Tumour of the parotid gland

f) Neurofibromatosis of thenose showing multiple nodules

g) Right pinna keloid on medial surface

h) Dacrocystopyocele left eye in a child

The most common etiology for head and neck swelling among the study participants was found to be infective/inflammatory – 105 patients (55.2%), followed by malignant lesions – 30 patients (15.7%), developmental/ congenital causes – 24 patients (12.6%), benign lesions – 21 patients (11%), traumatic causes – 7 patients (3.6%) and vascular – 3 patients (1.5%) (Figure no.2).

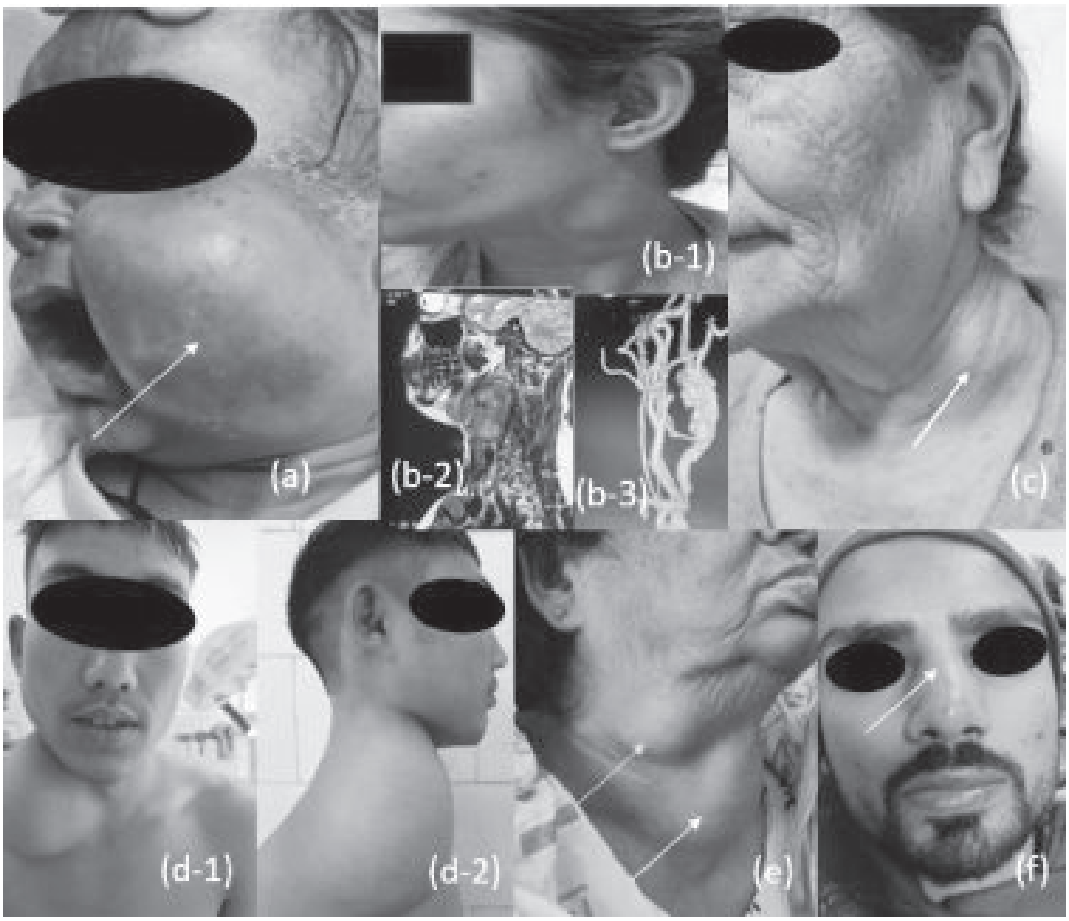

Figure 2: Clinical photograph showing the distribution of the study population according to etiology

a) Developmental/Congenital : Spindle Cell Rhadomyosarcoma in an infant

b) Vascular- Carotid body tumour.

- b-1: Presentation- swelling left side of neck
- b-2: MRI neck showing large lesion approximately 55x45x40mm at left common carotid bifurcation causing splaying of ICA and ECA with complete encasement of ICA, ECA and CCA.
- b-3: CT angiography showing carotid body tumor

c) Inflammatory: Left Supraclavicular Suppurative lymphadenitis

d) Benign: Frontal(d-1) And Lateral view(d-2) of lymphangioma

e) Malignant: Papillary CA Thyroid (white arrow) with Level II secondary(yellow arrow)

f) Trauma: Post-traumatic swelling of nose

Clinically, the majority of the patients presented with a swelling were 64.7%, while 22.6% of patients had pain, 6.3% had difficulty in swallowing, 2.6% had fever, 1.5 % complained of difficulty in breathing and only 1.05% each presented with change of voice and epiphora.

The most commonly involved tissue of origin in the neck was the thyroid gland – 64 patients (47.05%), followed by lymph nodes – 36 patients (26.4%), skin and soft tissue lesions – 25 patients (18.38%), and submandibular gland- 8 patients (5.8%). Sublingual gland, carotid body tumor, Schwanomma accounted for 1 patient each (0.73% each).

Among the neck swellings, 116 out of 190 participants had involvement of the anterior triangle of the neck,17 had posterior triangle involvement and 3 patients(2.2%) had diffuse swelling. Among the Anterior triangle, 73(62.93%) had muscular triangle involvement, 29(25%) involved the submandibular triangle,11(9.48%) involved the carotid triangle and only 3 (2.5%) involved submental triangle. Suboccipital triangle involvement was seenin13(76%)and supraclavicular triangle involvement was seen in4 patients (23.5%) of posterior triangle swellings.

Table III denotes that 50 out of 190 patients had soft tissue lesions and the distribution of various types(**Figure no. 3)**

Table-III:

Distribution Pattern based on Skin and soft tissue lesions of the head and neck region

Skin and soft tissue lesions	Frequency	Percentage(%)
Epidermoid/Sebaceouscyst	8	16
Thyroglossal Ductcyst	4	8
Dermoidcyst	2	4
Branchialcyst	3	6
Mucousretentioncyst	2	4
Nasolabialcyst	2	4
Furunculosis	2	4
Lipkeratinoushorn	1	2
Pinnakeloid	4	8
PinnaSeroma	2	4
Lymphangioma	1	2
Hemangioma	1	2
Deepneckabscess	5	10
Subperiostealabscess	4	8
Lipoma	4	8
Infected preauricular sinus	4	8
Ranula	1	2
Total	50	100

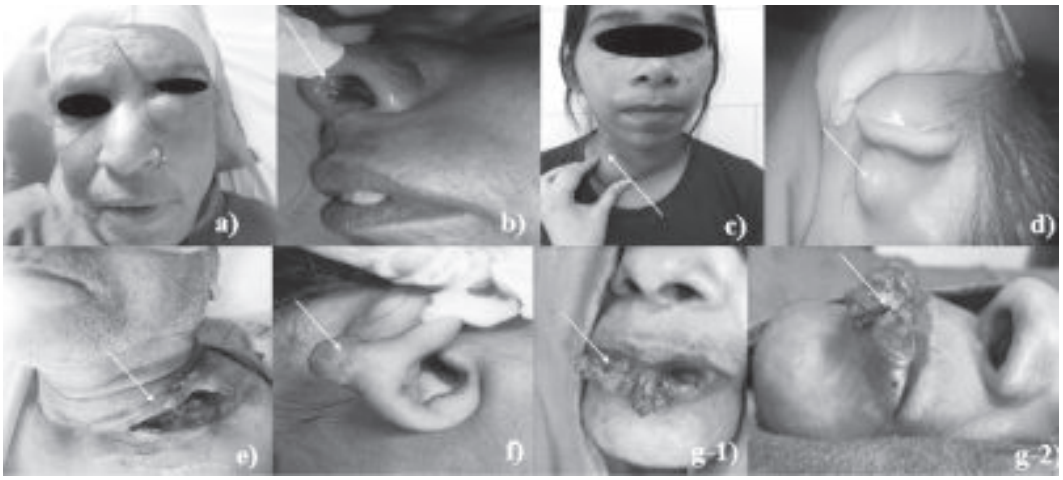

Figure 3: *Clinical Photograph showing various skin and soft tissue swellings of the study population*

a) Epidermal inclusion Cyst left lower eyelid
b) Furunculosis left nasal cavity
c) Lipoma right-side neck
d) Subperiosteal abscess left postaural region
e) Deep neck abscess: picture post incision and drainage
f) Keloid left pinna

g-1) and g-2) Frontal and Lateral clinical photograph of keratinous horn of lip

Among patients with salivary gland involvement, the parotid gland was most frequently affected – 14 patients (60.8%), followed by the submandibular gland – 8 patients (34.7%), and the sublingual gland – 1 patient (4.34%). **(Table IV)**

Table-IV:
Distribution pattern of salivary gland involvement

Salivary gland	Nonneoplastic	Benign	Malignant	Total
Parotid gland	Parotitis: 7	6: 5-Pleomorhic adenoma 1- Warthin Tumour	1- Mucoepidermoid-carcinoma	14
Submandibular gland	Sialadenitis:7 Without sialolithiasis-2 With sialolithiasis-5	0	1- Adenoid Cystic Carcinoma	8
Sublingual gland	0	1	0	1
Minor salivary Gland	0	0	0	0
Total	14	7	2	23

A total of 38 cases of lymph node enlargement were seen in head & neck cases. 8 lymph nodes were classified as reactive(21%), 12 with tubercular(31.5%), 6 were suppurative (abscess) (15.7%) and 11 had changes suggestive of carcinoma(28.9%), while only 1 accounted for Hodgkins lymphoma(2.6%).

Table-V shows various thyroid gland lesions. USG had a sensitivity of 80% (CI=51.91-95.67%) and a specificity of 91.84% (CI=80.40- 97.73%) in predicting malignancy. The positive likelihood ratio was 9.8 (CI=3.71-25.92) while the negative likelihood value was 0.22 (CI=0.08-0.60) with an accuracy of 89.06 % (CI=78.75-95.49%). The positive predictive value was 75% (CI=53.15%to88.81%) while the negative predictive value was 93.75% (CI=84.45%to97.64%).With regards to FNAC, for malignant diseases, sensitivity was 80% (CI=51.91-95.67%) and specificity was 85.71% (CI=72.76-94.06%). Thepositive likelihoodratiowas5.6(CI=2.70-11.63%)while the negative likelihood value was0.23(CI=0.08-0.65%) with an accuracy of 84.38% (CI=73.14-92.24%).The positive predictive value was 5.6(CI=2.70-11.63%)while the negative likelihood value was0.23(CI=0.08-0.65%).

Table-V:
Distribution of thyroid gland lesions

Thyroidglandlesions	Frequency	Percentage
Multinodular/Colloidgoitre	37	57.8
Papillary carcinoma	9	14
Follicular carcinoma	3	4.6
Follicular adenoma	6	9.3
Subacute granulomatous thyroiditis	3	4.6
Autoimmune thyroiditis	2	3.1
Anaplastic carcinoma	1	1.5
Medullary carcinoma	2	3.1
Non-invasive follicular thyroid neoplasm withpapillary like nuclear features (NIFTP)	1	1.5
Total	64	100

Discussion:

The present study provides a comprehensive overview of the epidemiology, clinical presentation, and diagnostic modalities for head and neck swellings.

The current study reported that the majority of patients belonged to the age group of 31 to 40 years (67, 35.2%),with a mean age of 36.20 years. This is consistent with the findings of *Rathod et al,* which reported maximum incidence of head and neck swellings in 21 to 30 years of age[6]. *Patil et al* also reported the maximum patients (34.1%) in the age group of 18 to 40 years in their study[7]. The higher incidence in 31-40 years age group in this study is likely due to higher health seeking behaviour of younger age group and more health consciousness as also reported by *Inoh et al*.[8]

This study found that non-neoplastic masses were the most common in all age groups, and no malignant masses were observed in individuals below 30 years of age. This distribution supports the findings by *Itagi et al*, who also noted a higher prevalence of inflammatory lesions and a lower incidence of malignancy in younger age groups[9]. The present study findings were thus in concordance with the majority of the studies as inflammatory/ developmental lesions were more likely to present in younger age groups and the frequency decreases with age[10].

In this study, benign neck swellings were highest in the age groups 31-40 years (52%) while lowest were seen in 11-20 years as well as in old age **(Table 1**), which is consistent with the findings of the study conducted by *Paikrao et al*[11] who reported that the

commonest age groups affected were 21-30 years (30.68%) followed by 13-20 years (23.8%).

The majority of malignant neck lesions – 14 patients in the present study were seen in the age group 31-40 years (46.6%) (Table 1). In this study, the findings are in contrast with many studies like *Biswas et al*, *Sharma et al* and *Lei et al* which reported peak age group as 5th and 6th decade of life.(12,13,14) But are in concordance with a study by *Bagate et al*, where malignant head and neck lesions occurred most in the age group 21- 40 years (39.4%)[10].

Also, it is a well-established fact that squamous cell carcinoma rates increase with age[14],a finding also supported by the present study. This maybe attributed to the prolonged exposure to multiple risk factors such as cigarette smoking, alcohol consumption, tobacco chewing, etc (15,16) leading to the development of malignancy.

In this study, 107 (56.3%) subjects from the study population of 190 patients were females, while 83 (43.6%) were males. The female preponderance is similar to a study by *Ahmad et al,* which also included 68% of females with complaints of neck swelling, and *Joshi et al* which revealed a higher incidence of thyroid swelling among females[4,17.]

The anatomical site of involvement in our study participants predominantly included the anterior triangle of the neck – 116 patients (85.2%), similar to the studies by *Gupta et al*,*Patil et al and Abraham et al*[7,18,19]. In our study, among the anterior triangle, more than half of the neck swellings-73 patients involved the muscular triangle (53.6%), followed by submandibular triangle- 29 patients (21.3%). Posterior triangle swellings accounted for only 17 cases (12.5%) out of which 13 (9.5%) involved the suboccipital triangle and 4 (2.9%) involved the supraclavicular triangle, while diffuse neck swellings were seen in 3 patients (2.2%). Location of lymph nodes is fairly consistent in an unviolated neck and can point to specific head and neck mucosal cancers and inflammatory conditions site as they follow an expectable pattern[20].

In the current study, tenderness was seen in 52 (27.6%) of study participants, contrasting with the findings of *Patil et al,* which suggested tenderness in only 18 (21%) cases[7].73 (38.4%) patients had swellings of soft consistency, 74 (38.9%) firm, 23 (21.0%) had cystic, and only 20 (10.5%) had hard consistency. However, the study by *Patil et al* reported a higher prevalence of swelling with firm consistency followed by soft consistency[7].

Among patients with salivary gland involvement, sialadenitis was the most common. *Subitha et al*stated similar findings with sialadenitis as the most common benign swelling and pleomorphic adenoma being the commonest neoplastic swelling[21]. The study by *Chauhan et al* also concluded that Pleomorphic adenoma is the most common benign tumor of salivary glands, while the commonest malignancy seen in salivary glands is mucoepidermoid carcinoma.[22]

In our study, the evaluation of lymph nodes revealed thatthelargest subgroup- 12 (31.5%) was tubercular, followed closely by metastasis- 11 (28.9%). Our study results supported the study conducted by *Rai et al,* which stated tubercular lymphadenitis as the most common non-thyroidal neck swellings[22]. *Ahmad et al*reported that tuberculous lymphadenitis was the most common diagnosis in their study of 50 patients, followed by reactive lymphadenitis and malignant neoplasms[4]. *Paikrao et al* also reported tuberculosis as the most frequent cause of cervical lymphadenopathy in a rural tertiary health care center[11].

With consideration to skin and soft tissue swelling, clinical examination was mainly relied on, with some diagnoses based on Ultrasound alone, especially cystic swelling, and the rest using both ultrasound and FNAC. As regards to the diagnosis of lymph nodes, FNAC was mainly relied on. Concerning salivary gland swellings, USG was the chief diagnostic modality in submandibular sialadenitis and parotitis, and FNAC in diagnosing benign lesions like pleomorphic adenoma and malignant lesions like mucoepidermoid carcinoma and adenoid cystic carcinoma. On correlating the final HPE report with pre-operative USG, we found that the sensitivity for detecting malignant disease by USG was 80%, while the specificity was 91.84%. The overall accuracy was 89.06%. On collating the FNAC findings with those of the final HPE report, we found that the sensitivity for detecting malignant disease by FNAC was 80%, and the specificity was 85.71%, with an overall accuracy of 84.38%.

This study highlights the diagnostic role of FNAC in neoplastic lesions, USG in lymph nodes and inflammatory conditions, and emphasizes the importance of clinical judgement in infectious conditions. However, this study is limited by its relatively small size, despite the extensive repertoire of swellings. Additionally, bias may occur by including swellings with specific or rare diagnoses. Third, as an institution-based study, extrapolation of its results to the general population may not be straightforward.

Conclusion:

Most head and neck masses with identifiable causes tend to appear in predictable locations within certain age groups. This allows for a systematic method in determining a preliminary diagnosis, considering potential alternative diagnoses, and devising an appropriate treatment plan for patients with palpable masses.

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