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CLINICAL AND CYTOLOGICAL STUDY OF NON-THYROIDAL NECK SWELLINGS AND ITS CORRELATION WITH HISTOPATHOLOGICAL FINDINGS.

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ABSTRACT

Non-thyroidal neck swellings are a common clinical presentation with diverse underlying pathologies. Accurate diagnosis and management are crucial due to potential complications and the increasing incidence of head and neck cancers. This study was done to evaluate the adequacy and accuracy of Fine Needle Aspiration Cytology (FNAC) in diagnosing non-thyroidal neck swellings and to correlate its findings with histopathological examination. A retrospective observational study was conducted at Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur, India. Data were collected from 150 patients with non-thyroidal neck swellings over two years. Demographic details, clinical presentation, FNAC findings, and histopathological results were analyzed. The most common types of neck swellings were metastatic deposits (26%), tubercular lymphadenitis (20.1%), and neck space infections (9.3%). FNAC demonstrated high sensitivity (98.98%) and specificity (94.23%) in diagnosing non-thyroidal neck swellings compared to histopathological examination. FNAC is a reliable and accurate diagnostic tool for non-thyroidal neck swellings. Its high sensitivity and specificity highlight its effectiveness in differentiating benign from malignant conditions.

KEYWORDS

Non-thyroidal neck swellings, Fine Needle Aspiration Cytology (FNAC), Histopathological examination, Head and neck cancers, Diagnostic accuracy

INTRODUCTION:

Neck swellings are a common clinical presentation, often originating from the thyroid gland. However, accurate diagnosis and management become challenging when the swelling is non-thyroidal due to the diverse underlying pathologies. Beyond cosmetic concerns, these swellings can lead to significant pressure symptoms on vital structures like the trachea, esophagus, and major blood vessels.[1]

Common pathologies responsible for neck lumps include lymphadenopathies (both specific and non-specific), metastatic carcinoma, lymphoma, thyroid swellings, and salivary gland tumors. Less frequent causes encompass carotid body tumors, branchial cysts, thyroglossal cysts, cystic hygromas, pharyngeal pouches, and skin appendage lesions.[2] Notably, according to the National Cancer Registry Programme, India neoplasms in the neck region constitute a significant proportion of cancers in India, accounting for 23% in males and 6% in females.[3] Early diagnosis and treatment are crucial to minimize mortality and morbidity associated with neck secondary tumors, often overlooked due to their asymptomatic nature.

Clinical examination alone may provide initial clues, but further investigations, including fine needle aspiration cytology (FNAC), are often necessary to confirm or rule out malignancy.[4] FNAC is particularly valuable in the head and neck region due to its ease of access, excellent patient compliance, minimally invasive nature, and ability to avoid unnecessary surgery in non-neoplastic or inflammatory cases.[1] Additionally, FNAC aids in planning appropriate surgical interventions.

Given the increasing incidence of head and neck cancers in India and the challenges associated with diagnosing non-thyroidal neck masses,[5] this study aims to evaluate the adequacy and accuracy of FNAC in these cases, with a particular focus on histopathological correlation.

Methodology:

Study Setting And Design: The study was conducted in the Department of ENT at Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur. This study was designed as an observational study conducted over two years, from May 2022 to May 2024. The study population included all patients aged 18 years and above who presented with non-thyroidal neck swellings at the ENT outpatient department of Dr. Bhim Rao Ambedkar Memorial Hospital, Raipur, without any intervention from the researchers.

Sample Size Calculation: The sample size for this study was calculated using the following formula:

$$n = \frac{z^2_{1-\alpha/2}\, S_n\,(1 - S_n)}{d^2\,.\,P}$$

Where,

$z^2_{1-\alpha/2}$ = 1.64 at 90% CI

S_n = Sensitivity of FNAC with HPE

D = allowable error = 10%

P = Prevalence of neoplasm of neck cancer, which is 29%.[4]

The minimum sample size came to be 142 cases.

Inclusion And Exclusion Criteria: The inclusion criteria were all patients aged 18 years and above with non-thyroidal neck swellings who were willing to participate. Patients with thyroid neck swellings, a history of previous neck surgery, or those who had undergone neck irradiation were excluded from the study.

Data Collection Procedure: A thorough clinical examination was performed by the primary author, and detailed physical findings were recorded. The primary author documented FNAC and histological findings. A case record Performa was prepared specifically to assess non-thyroidal neck swellings.

Statistical Analysis: The statistical analysis involved presenting categorical data as numbers and percentages, while quantitative data were presented as Mean ± SD or Median. Frequency distributions and graphs were prepared for the variables to visualize the data effectively. The correlation between histopathological examination with FNAC and clinical diagnosis was assessed using sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy. Data were analyzed using suitable statistical software, with a P value < 0.05 considered statistically significant.

RESULTS:

Our study included 150 patients with non-thyroidal neck swellings. The age distribution of the patients showed that the majority were over 50 years old (26.7%), followed by those aged 21-30 years (23.3%), 31-40 years (20.7%), 18-20 years (16.7%), and 41-50 years (12.7%), with a mean age of 39.4 ± 17.54 years. Gender distribution revealed that 54.7% of the patients were male and 45.3% were female, resulting in a male-to-female ratio of 1:1.20. Clinically, 43.33% of the cases were diagnosed with infective/inflammatory pathology, 38% with malignant pathology, and 18.67% with benign pathology. (See Table 1)

Table 1. Clinical Characteristics for study participants (n=150)

Variables	Frequency (n=150)	Percentage (%)
Age (Mean ± SD = 39.4 ± 17.54)		
18 to 20	25	16.7
21 to 30	35	23.3

31 to 40	31	20.7
41 to 50	19	12.7
>50	40	26.7
Gender		
Male	82	54.7
Female	68	45.3
Clinical diagnosis		
Infective/Inflammatory	65	43.33
Malignant	57	38
Benign	28	18.67

Table 2 presents the distribution of various types of neck swellings, with a higher prevalence in males compared to females. Metastatic deposits are the most common type, accounting for 26% of cases, followed by tubercular lymphadenitis at 20.1%. Other notable swellings include neck space infections (9.3%), lipomas (8.6%), and non-specific lymphadenitis (8%). Less common types include epidermal inclusion cysts (7.3%), lymphomas (5.3%), and chronic granulomatous lesions (3.3%).

Table 2. Type of Swelling in the Participants (n=150)

Types Of Neck Swelling	Male (n=82)	Female (n=68)	Total (n=150)	Percentage (%)
Metastatic Deposits	25	14	39	26
Tubercular Lymphadenitis	11	19	30	20.1
Neck Space Infection	5	9	14	9.3
Lipoma	8	5	13	8.6
Non-Specific Lymphadenitis	7	5	12	8
Epidermal Inclusion Cyst	8	3	11	7.3
Lymphoma	6	2	8	5.3
Chronic Granulomatous Lesion (Non-Tubercular)	0	5	5	3.3
Sialadenitis	3	1	4	2.7
Branchial Cyst	2	1	3	2
Schwannoma	1	2	3	2
Thyroglossal Cyst	2	1	3	2
Rannula	2	0	2	1.3
Langerhans Cell Histiocytosis	1	0	1	0.7
Lymphangioma	1	0	1	0.7
Pleomorphic Adenoma	0	1	1	0.7

The most frequent site for metastatic deposits is an unknown primary, accounting for 23.1% of the cases. This is followed by the oral cavity, which represents 20.5% of the cases. The larynx is the third most common site, with 17.9%. Both the nasopharynx and hypopharynx account for 10.3% of the cases. The oropharynx is the primary site in 7.7% of the cases. Less common sites include the breast, gastric, sinonasal, and thyroid, each contributing 2.6% to the total cases. (See Table 3)

Table 3. Primary Site of metastatic deposits (n=39)

Primary site	Frequency (n=39)	Percent (%)
Unknown Primary	9	23.1
Oral Cavity	8	20.5
Larynx	7	17.9
Nasopharynx	4	10.3
Hypopharynx	4	10.3
Oropharynx	3	7.7
Breast	1	2.6
Gastric	1	2.6
Sinonasal	1	2.6
Thyroid	1	2.6

Out of 150 cases, FNAC identified 100 cases as benign, with 97 confirmed as benign by HPE and 3 as malignant. Conversely, FNAC identified 50 cases as malignant, with 49 confirmed as malignant by HPE and 1 as benign. The statistical analysis reveals a high sensitivity of 98.98%, indicating that FNAC is highly effective in correctly identifying malignant cases. The specificity is 94.23%, showing that FNAC is also reliable in identifying benign cases. The positive likelihood ratio of 17.16 suggests that a positive FNAC result is a strong indicator of malignancy, while the negative likelihood ratio of 0.01 indicates that a negative FNAC result is a strong indicator of benignity. Overall, the accuracy of FNAC is 97.33%, demonstrating its reliability as a diagnostic tool when compared to the HPE gold standard. (See Table 4)

Table 4. Considering the HPE gold standard, the correlation between FNAC and HPE

	HPE – Benign	HPE – Malignant	Total
FNAC- Benign	97	3	100
FNAC – Malignant	1	49	50
Total	98	52	150

Statistic	Value	95% CI Lower	95% CI Upper
Sensitivity	98.98%	94.45%	99.97%
Specificity	94.23%	84.05%	98.79%
Positive Likelihood Ratio	17.16	5.72	51.47
Negative Likelihood Ratio	0.01	0	0.08
Disease prevalence	65.33%	57.14%	72.91%
Positive Predictive Value	97.00%	91.51%	98.98%
Negative Predictive Value	98.00%	87.44%	99.71%
Accuracy	97.33%	93.31%	99.27%

DISCUSSION:

The present study aimed to evaluate the clinical presentation, cytological characteristics, and histopathological correlations of non-thyroidal neck swellings in 150 patients, whose average age was 39.4 years (± 17.54). The most common clinical diagnosis was cervical lymphadenopathy (70.9%), followed by cystic neck swelling (17.9%), inflammatory neck swelling (6.6%), and submandibular swelling (4.6%). Fine Needle Aspiration Cytology (FNAC) revealed 66.7% benign and 33.3% malignant cases, with histopathological examination confirming 65.3% benign and 34.7% malignant cases. FNAC showed a sensitivity of 98.98%, specificity of 94.23%, positive predictive value of 97.00%, and negative predictive value of 98.00%, with an overall accuracy of 97.33%. Among 39 patients with metastatic neck deposits, 20.1% had unknown primary sites, with the most common primary sites being the oral cavity (20.5%) and the larynx (17.9%).

Demographic Distribution:

The study included 150 patients with non-thyroidal neck swellings, with an average age of 39.4 years (± 17.54). The age distribution was as follows: 16.7% were under 20, 23.3% were between 21-30, 20.7% were between 31-40, 12.7% were between 41-50, and 26.7% were above 50. The gender distribution was 54.3% male and 45.7% female. The study included patients aged 18 years and older, with the youngest being 18 and the oldest 85 years old. Al-Qudehy et al. (2017) reported a high incidence of reactive/nonspecific lymphadenitis in pediatric patients (73.7%) and adults (50.8%), with tuberculosis lymphadenitis also common in adults (32.5%).[6] Neoplasms constituted 16.7% of cases, with a notable proportion of metastatic origin (45%). Our study found secondary metastatic lymph nodes as the most common neck swelling (26%), followed by tubercular lymphadenitis (20.1%). This distribution highlights a similar pattern of inflammatory and neoplastic causes in non-thyroidal neck masses.[6]

Our study had a male predominance (54.3%), like Karthikeyan et al. (2019), which reported a male predominance of 51%.[7] The age distribution in our study averaged 39.4 years, with significant findings in those over 40, aligning with Karthikeyan et al., where 30% of participants were over 40 years old.[7] In a study conducted by Athavale et al. (2019), 100 patients were included with an equal male-to-female ratio (1:1) and a mean age of 40.41 ± 12.85 years.[4] Our study observed a similar age range of participants, indicating that neck swellings are common across various age groups, but particularly prevalent in middle-aged individuals. Mantri et al. (2020) reported that most cases clustered between the ages of 31 and 60, with a male-to-female ratio of 1.5:1,[8] indicating a higher male predominance compared to our study.

Clinical Presentation:

In the present study, the clinical diagnoses were diverse, with the most common being cervical lymphadenopathy (70.9%), followed by cystic neck swelling (17.9%), inflammatory neck swelling (6.6%), and submandibular swelling (4.6%). Karthikeyan et al. (2019) reported tuberculous adenitis (27%) as the most common swelling, followed by secondary metastatic lymph nodes (26%).[7] In our study, cervical lymphadenopathy was the most common diagnosis (70.9%), followed by cystic neck swellings (17.9%). Both studies highlight the prevalence of lymphadenopathy, particularly tuberculous, in the region.

Mantri G et al. (2020) found that most neck masses were benign

(36.4%), followed by inflammatory (27.08%), cystic (20.83%), and malignant (15.63%).[8] FNAC impressions were similar, with benign masses at 32.29%, inflammatory masses at 26.04%, cystic masses at 19.79%, and malignant masses at 15.63%. Our study identified cervical lymphadenopathy (70.9%) as the most common clinical diagnosis, followed by cystic neck swelling (17.9%), inflammatory neck swelling (6.6%), and submandibular swelling (4.6%). The similar distribution of clinical diagnoses across both studies underscores the prevalence of benign and inflammatory neck masses.[8]

Bhasker (2021) listed sebaceous cysts, cervical lymphadenopathy, benign lipomas, lymph nodes, thyroid swellings, and tuberculosis lymphadenitis,[9] which aligns with our findings, particularly in the prevalence of cervical lymphadenopathy and tubercular lymphadenitis. Our study found metastatic deposits (26%), tubercular lymphadenitis (20.1%), neck space infections (9.3%), lipomas (8.6%), and non-specific lymphadenitis (8%) as common types of swellings. This similarity indicates a consistent pattern in the types of neck swellings encountered in clinical practice.

Correlation between FNAC and HPE:
In the present study, using histopathological examination (HPE) as the gold standard, the sensitivity and specificity of Fine Needle Aspiration Cytology (FNAC) diagnosis were 98.98% and 94.23%, respectively. Balm et al. (2010) highlighted the sensitivity (81%) and specificity (100%) of FNAC, emphasizing its critical role as the second diagnostic step after ENT examination.[1] FDG-PET/CT was also recognized for its utility in identifying occult primary carcinomas and influencing clinical decisions. Al-Qudehy et al. (2017) demonstrated a high sensitivity (96.77%) and specificity (92.1%) for FNAC, with an overall accuracy of 95.68%.[6] The study emphasized FNAC's effectiveness in both adult and pediatric populations when performed by experienced practitioners. Our study reported slightly higher sensitivity (98.98%) and specificity (94.23%) for FNAC. The close alignment of results between the two studies underscores FNAC's reliability in diagnosing neck masses.

Karthikeyan et al. (2019) found FNAC to be a reliable diagnostic method.[7] However, they noted no significant statistical correlation between FNAC and histopathological diagnoses, a point of divergence from our findings, where FNAC showed high diagnostic accuracy. Both studies emphasized the efficacy of FNAC in diagnosing neck swellings. Our study reported high sensitivity (98.98%) and specificity (94.23%) for FNAC. Athavale et al. (2019) reported a sensitivity of 81.8% and specificity of 100% for FNAC when compared to HPE.[4] They emphasized the need for accurate diagnostic protocols to avoid delays in treatment. Our study reported higher sensitivity (98.98%) and comparable specificity (94.23%) for FNAC, demonstrating its high diagnostic accuracy in our cohort. Both studies emphasize the importance of FNAC as a critical diagnostic tool for evaluating neck swellings.

Bhasker N et al. (2021) highlighted the use of advanced imaging techniques such as CT, MRI, PET-CT, and ultrasonography as gold standard methods for head and neck examination.[9] They acknowledged FNAC as an effective, simple, and sometimes the only tool for diagnosing lymph node malignancies. Our study primarily utilized FNAC and histopathological examination for diagnosis. The complementary use of FNAC and imaging techniques in both studies reflects a comprehensive approach to diagnosing head and neck swellings.

Strength And Limitations: The study provides a thorough examination of non-thyroid neck swellings, covering a wide range of etiologies, diagnostic modalities, and management strategies. The use of FNAC demonstrated high sensitivity and specificity, reinforcing its reliability as a diagnostic tool. However, the findings are based on data from a single center, which may limit the generalizability of the results.

CONCLUSION:

Our study provides significant insights into the demographic and clinical characteristics of non-thyroidal neck swellings, emphasizing the importance of cytological and histopathological correlation for accurate diagnosis and effective treatment planning. The data highlight the variability in age and gender distribution across different types of neck swellings and emphasize the reliability of FNAC as a diagnostic tool, with a sensitivity of 98.98% and a specificity of 94.23%, with an overall accuracy of 97.33%. Further studies are needed to explore the role of FNAC in guiding treatment decisions and improving patient outcomes.

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