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Original Research Article

Demographic, Clinical, and Cytological Spectrum of Neck Swellings: A Ten-Year Retrospective Study at a Tertiary Care Hospital

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Abstract

Background: Neck swellings are a frequent clinical presentation encompassing a wide spectrum of causes, from benign thyroid lesions to malignant, salivary gland, and lymph node pathologies. Early recognition and accurate diagnosis are essential to reduce morbidity, particularly in regions where patients often present at advanced stages.

Objective: This study aimed to analyze the demographic distribution, clinical presentation, and cytological diagnosis of neck swellings, with special emphasis on unusual cases and the correlation between fine-needle aspiration cytology (FNAC) and ultrasonography (USG).

Materials and Methods: This retrospective observational study was conducted at a tertiary care hospital at Annapoorana Medical College & Hospitals, Kombadipatty, and Salem over ten years (March 2010 – February 2021). Forty patients with neck swellings were included. Clinical history, physical examination, and investigations (USG, FNAC, histopathology where available) were reviewed. Data were analyzed using descriptive statistics, with cross-tabulation of age, gender, symptoms, and diagnosis, and concordance between FNAC and USG was assessed.

Results: The cohort comprised 40 patients (30 females, 10 males) with a mean age of 45 years. Females predominated (F:M = 3:1), and the majority of cases clustered in the 41–60 years group. The most common presenting symptom was palpitation (42.5%), followed by dysphagia (22.5%), hoarseness (17.5%), and shortness of breath (15%). FNAC identified benign thyroid swellings as the most frequent diagnosis (65%), with colloid/nodular goiter (35%) and Hashimoto's thyroiditis (25%) leading the spectrum. Malignancy was rare (5%), while salivary gland lesions accounted for 10% and unspecified cases for 20%. FNAC–USG concordance was low (25.6%), with discordance in 74.4%. Rare but significant cases included Wilson's disease, Hashitoxicosis, parotid abscess, and post-parotidectomy complications.

Conclusion: Neck swellings most commonly affect middle-aged females and are predominantly benign thyroid lesions. FNAC remains the gold standard for initial evaluation, outperforming USG in diagnostic reliability. Integrating demographic patterns, symptom associations, and cytology enhances diagnostic precision, while rare cases highlight the need for broad clinical suspicion and multimodal evaluation.

Keywords: Neck swellings; Fine-needle aspiration cytology (FNAC); Ultrasonography; Thyroid disorders; Salivary gland lesions; Hashimoto's thyroiditis; Colloid goiter; Neck masses.

Introduction

Neck swellings constitute a common clinical presentation encountered in surgical and medical practice, with a wide range of possible etiologies. These swellings may arise from congenital, inflammatory, neoplastic, or systemic conditions, and their varied presentations pose a diagnostic challenge for clinicians [1]. Although many swellings are benign, the potential for malignancy necessitates thorough evaluation and timely management. In developing countries like India, where awareness and healthcare access may be limited, neck swellings are often diagnosed at an advanced stage, thereby increasing patient morbidity and mortality [2]. Among the diverse causes, thyroid lesions represent the most frequent etiology of neck swellings. Benign conditions such

as colloid goiter and Hashimoto's thyroiditis account for the majority of cases, whereas thyroid malignancies, though less common, remain clinically significant due to their aggressive course and potential for airway or esophageal compression [2]. Non-thyroidal causes include lymph node pathologies, salivary gland lesions, and infectious processes such as abscesses. Rare systemic conditions, exemplified by Wilson's disease or autoimmune thyroiditis manifesting as Hashitoxicosis, further expand the spectrum of neck swellings and highlight the importance of considering atypical differentials in diagnosis [3].

Clinical evaluation begins with a detailed history and examination, focusing on symptoms such as neck swelling, dysphagia, hoarseness, palpitations, and systemic features. While these provide initial diagnostic clues, investigations remain indispensable for confirmation [4]. Ultrasonography (USG) of the neck serves as a useful imaging modality to define the anatomical site and extent of the lesion; however, its specificity is limited. Fine-needle aspiration cytology (FNAC), on the other hand, is widely regarded as the gold standard initial diagnostic tool, being simple, cost-effective, and minimally invasive. Biopsy and histopathology may be reserved for cases where cytology is inconclusive or when malignancy is suspected [5].

Several studies have demonstrated the predominance of neck swellings in females, particularly in the second to fourth decades of life, with thyroid swellings forming the bulk of cases. Epidemiological data suggest that the incidence of thyroid malignancy is approximately 23% in males and 6% in females in India, with risk factors including poor oral hygiene, chronic infections, tobacco use, and genetic predisposition [6,7]. Despite this knowledge, there remains a paucity of region-specific data from tertiary care centers, which are vital for understanding local disease patterns and tailoring diagnostic strategies.

Given this background, the present study was undertaken at a tertiary care hospital to analyze the incidence and prevalence of neck swellings over a ten-year period. The study aimed to evaluate demographic characteristics, clinical presentations, and the diagnostic role of FNAC in differentiating benign from malignant lesions.

Special attention was given to rare cases with atypical presentations, as these provide valuable insights into the broad clinical spectrum of neck swellings. By integrating clinical, radiological, and cytological findings, this study seeks to contribute to improved diagnostic accuracy, early intervention, and better patient outcomes.

Materials and Methods

Study Design and Setting: This was a retrospective observational study conducted in the Department of Surgery at Annapoorana Medical College & Hospitals, Kombadipatty, Salem, covering a ten-year period from March 2010 to February 2021. All available inpatient and outpatient records of patients who presented with neck swellings during this timeframe were reviewed. The study was approved by the institutional ethics committee, and all patient details were handled with confidentiality.

Study Population: A total of 40 patients, aged between 9 and 70 years, were included in the study. Patients presented with various types of neck swellings, ranging from thyroid lesions to salivary gland and lymph node pathologies. Both male and female patients were studied, with females comprising the majority of cases. Exclusion criteria included patients with incomplete records, swellings secondary to trauma, and postoperative recurrence without proper histopathological documentation.

Clinical Evaluation: Each patient underwent a detailed history-taking and physical examination at the time of presentation. Symptoms such as palpitations, dysphagia, and hoarseness, shortness of breath, weight loss, and systemic features were specifically noted. Clinical examination included inspection, palpation, and assessment of the anatomical site of the swelling, with particular attention to the involvement of midline, lateral neck, supraclavicular, or salivary regions. Special clinical findings such as tremors, exophthalmos, trismus, and salivation were documented in cases with unusual presentations.

Diagnostic Workup: All patients were evaluated using a multimodal diagnostic approach. Ultrasonography (USG) of the neck was performed to assess the anatomical location, extent, and consistency of the swelling. Fine-needle aspiration cytology (FNAC) was carried out in all accessible cases and served as the primary diagnostic tool for initial categorization of lesions into benign, malignant, or inflammatory. In select cases, biopsy and histopathology were performed to confirm or clarify the diagnosis. Ancillary investigations, including thyroid function tests and relevant biochemical assays, were ordered when systemic symptoms suggested thyrotoxicosis or metabolic involvement, such as in Wilson's disease.

Data Collection and Analysis: Demographic details, presenting symptoms, clinical findings, and diagnostic test results were extracted from patient case records and compiled into a structured proforma. Data were analyzed using descriptive

statistics, including frequency, percentage, mean, and median values.

Cross-tabulation was performed to evaluate associations between age, gender, clinical presentation, and diagnostic outcomes.

Comparative analysis of FNAC with USG findings was conducted to assess concordance and diagnostic reliability. Results were presented in the form of tables and figures for clarity.

Result

Demographic Profile: A total of 40 patients with neck swellings were analyzed in this retrospective study. The age of the cohort ranged from 9 to 70 years, with a median of 48 years and a mean of 45 years. The overall gender distribution demonstrated a marked female predominance (75%, n=30) compared to males (25%, n=10), yielding a sex ratio (F: M) of 3:1. The detailed age and gender distribution is summarized in Table 1.

Table 1: Age and Gender Distribution of Patients with Neck Swellings

Variable	Value	Percentage (%)	Notes
Total patients	40	100	Complete dataset analyzed
Male	10	25.0	
Female	30	75.0	
Sex ratio (F:M)	3:1	–	
Age Range (years)	9 – 70	–	Minimum and maximum observed
Mean Age (years)	45.0	–	± SD = 12.1 years
Median Age (years)	48.0	–	
Q1 (25th percentile)	36.0	–	
Q3 (75th percentile)	55.0	–	
Interquartile Range	19.0	–	Spread of middle 50% of patients

Percentages are calculated on the full cohort (n = 40). Standard deviation (SD), quartiles, and IQR provide measures of variability. The sex ratio indicates three females for every male patient in the study population. The demographic distribution highlights that neck swellings are more prevalent among females, with a 3:1 female-to-male ratio.

The peak occurrence is in middle age (41–60 years), supported by a median of 48 years and an IQR spanning 36–55 years.

The broad age range confirms that neck swellings can present in both younger (<20 years) and older (>60 years) populations, necessitating age-specific diagnostic vigilance.

Table 2: Frequency of Clinical Symptoms among Patients with Neck Swellings

Symptom	Frequency (n)	Percentage (%)	Notes
Palpitation	17	42.5	Predominant in thyroid-related disorders
Dysphagia	9	22.5	Often due to compression from swelling
Voice change / Hoarseness	7	17.5	Suggestive of recurrent laryngeal involvement
Shortness of breath	6	15.0	Related to large or retrosternal goiters
Loss of weight	6	15.0	Constitutional symptom, possible malignancy
Pain	5	12.5	Non-specific, seen in parotid/thyroid cases
Fatigue	4	10.0	General systemic feature
Loss of appetite	3	7.5	Often associated with chronic illness
Tremors	2	5.0	Seen in Wilson's disease, thyrotoxicosis
Sweating	2	5.0	Hyperthyroid-related
Diarrhoea	2	5.0	Toxic multinodular goiter (LT lobe)
Exophthalmos	1	2.5	Hyperthyroidism
Chest pain	1	2.5	Hashitoxicosis
Fever	1	2.5	Parotid abscess
Trismus	1	2.5	Parotid abscess
Increased salivation	1	2.5	Salivary gland involvement
Myalgia	1	2.5	Non-specific

Clinical Presentation: Patients most commonly presented with neck swelling accompanied by systemic and local symptoms. Among the 40 patients, the most frequent associated complaint was palpitation (42.5%), followed by dysphagia

(22.5%), voice change/hoarseness (17.5%), and shortness of breath (15.0%).

Other symptoms such as weight loss, fatigue, pain, tremors, and gastrointestinal features were less common but clinically relevant. The detailed frequency of presenting symptoms is outlined in Table 2.

Percentages are calculated on the total cohort (n = 40). Some symptoms were rare and specific to unique cases (e.g., fever and trismus in parotid abscess, chest pain in Hashitoxicosis, tremors in Wilson's disease).

The findings indicate that systemic hyperthyroid features (palpitations, sweating, tremors) and local compressive symptoms (dysphagia, hoarseness, shortness of breath) were the predominant presentations. The high frequency of palpitations (42.5%) underscores the thyroid origin in most cases, while less frequent but significant features such as weight loss and voice change raise suspicion of malignancy.

Rare symptoms like fever, trismus, and increased salivation reflected isolated parotid pathology.

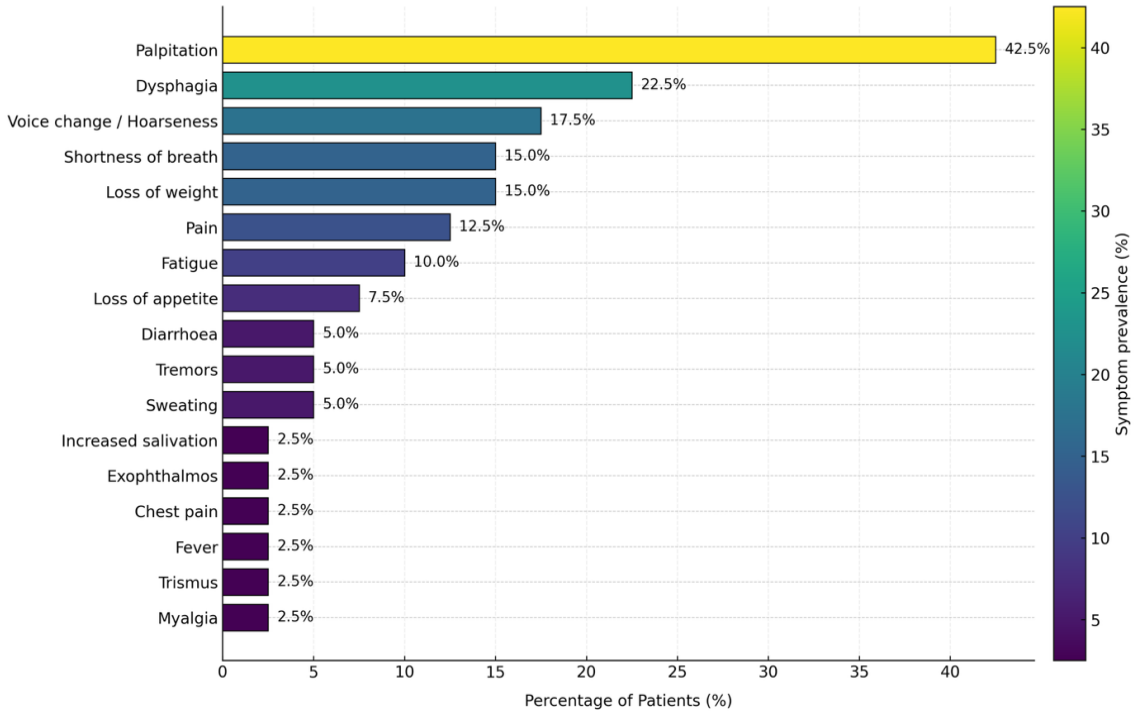

Figure 2: Clinical Symptom Distribution among Patients with Neck Swellings (n = 40)

A horizontal bar chart illustrating the percentage of patients with each clinical symptom. Palpitations were the most common, while rare symptoms included fever, trismus, and increased salivation.

The results emphasize that thyroid-related systemic features (palpitations, sweating, tremors) and compressive symptoms (dysphagia, hoarseness, shortness of breath) are the most common clinical associations of neck swellings.

The prominence of palpitations (42.5%) strongly suggests thyroid origin in many cases, while less frequent but significant symptoms like weight loss and voice change highlight the need for suspicion of malignancy. Rare findings (fever, trismus, salivation) pointed to parotid pathology, underscoring the diverse etiologies encompassed under the clinical presentation of neck swellings.

Distribution by Diagnosis: FNAC revealed that benign thyroid swellings accounted for the majority, with colloid/nodular goiter (35%) and Hashimoto's thyroiditis (25%) leading the list. When combined with toxic goiter (5%), benign thyroid lesions represented 65% of cases. Salivary gland lesions accounted for 10%, while malignancy was rare (5%). Approximately 20% were unspecified/other due to inconclusive results. The expanded diagnostic distribution is presented in Table 3.

Table 3: Detailed FNAC Distribution of Neck Swellings

Diagnosis Category	Group	Frequency (n)	Percentage (%)	Cumulative (n)	Cumulative (%)
Colloid/Nodular Goiter	Benign Thyroid	7	35.0	7	35.0
Hashimoto's Thyroiditis	Benign Thyroid	5	25.0	12	60.0
Other/Unspecified	Unspecified/Other	4	20.0	16	80.0
Salivary Gland Lesion	Salivary Gland	2	10.0	18	90.0
Toxic Goiter/Thyrotoxicosis	Benign Thyroid	1	5.0	19	95.0
Other Thyroid Carcinoma	Malignant Thyroid	1	5.0	20	100.0

Cumulative percentages track the progressive contribution of each category to the total FNAC cases (n = 20). Diagnostic categories were grouped into benign thyroid, malignant thyroid, salivary gland, and unspecified for clarity.

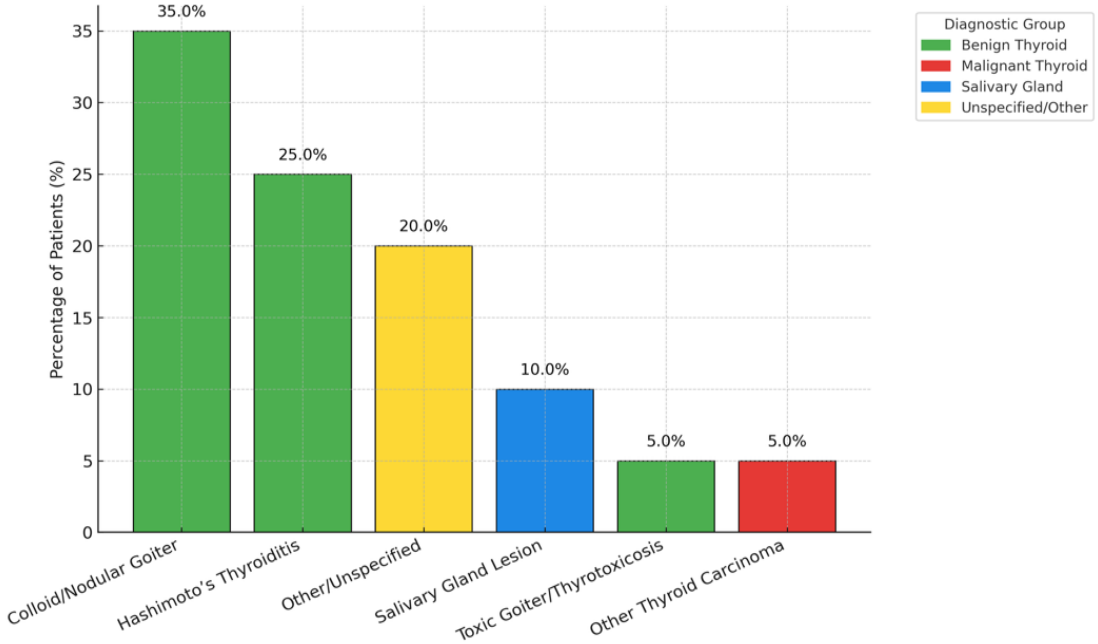

Figure 3. Detailed FNAC Distribution of Neck Swellings (n = 20)

Figure 3 by diagnostic category. Colors highlight benign thyroid (green), malignant thyroid (red), salivary gland (blue), and unspecified (yellow) lesions.

The expanded breakdown confirms that two-thirds of FNAC findings (65%) were benign thyroid lesions, establishing thyroid pathology as the dominant etiology of neck swellings in this cohort. Malignant cases were rare (5%), but their presence underscores the importance of FNAC as a screening tool. Salivary lesions (10%) and unspecified results (20%) highlight the need for a broader diagnostic workup, including imaging and histopathology, to complement cytology.

Diagnostic Modality Correlation: Among the 39 cases with both FNAC and USG results, concordance was noted in 10 cases (25.6%), while discordance was observed in 29 cases (74.4%). This corresponds to a concordant-to-discordant ratio of 1:2.9. The 95% confidence interval for concordance was 13.8–42.5%, indicating significant variability and a tendency toward disagreement between the two diagnostic tools table 4 figure 4.

Table 4: Detailed Correlation between FNAC and USG Findings

Metric	Value
Total cases with FNAC & USG	39
Concordant (FNAC = USG)	10
Discordant (FNAC ≠ USG)	29
Concordance Percentage (%)	25.6
Discordance Percentage (%)	74.4
Concordant : Discordant Ratio	1 : 2.9
95% CI for Concordance (%)	13.8 – 42.5

Concordance was defined as overlap between FNAC and USG diagnostic categories. Confidence interval calculated using Wilson's binomial method.

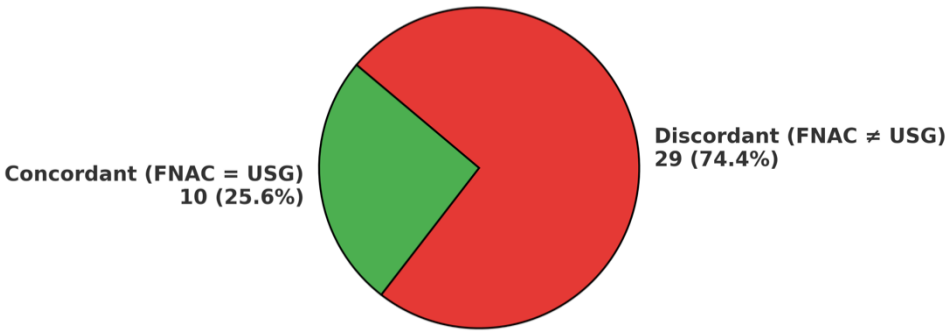

Figure 4: Concordance vs Discordance between FNAC and USG Findings (n = 39)

Figure 4 showing the relative proportions of concordant (green) versus discordant (red) cases. Discordance overwhelmingly dominates, highlighting the superior diagnostic reliability of FNAC.

The statistical analysis shows that FNAC is far more reliable than USG, given the low concordance rate (25.6%) and wide confidence interval. The high discordance suggests that USG should not be used in isolation for diagnostic decisions but rather as an adjunct to FNAC and histopathology.

Notable Case Summaries

Beyond the common thyroid and salivary gland swellings, a small subset of patients presented with unusual clinical features. These included neurological manifestations (Wilson's disease), autoimmune thyroiditis with hyperthyroid phases (Hashitoxicosis), infective pathology (Parotid abscess), and post-surgical sequelae (post-parotidectomy complications). The details of these patients are summarized in Table 5 and highlighted graphically in Figure 5.

Table 5: Notable Case Summaries of Neck Swelling Patients

Case Type	Age/Sex	Key Clinical Features	Notes / Significance
Wilson's Disease	15/F	Tremors, slurred speech, dysarthria, gait disturbance; positive family history; consanguineous parents	Rare metabolic disorder mimicking thyroid tremors; highlights systemic overlap.
Hashitoxicosis (n=2)	30/F, 42/F	Swelling, dysphagia, palpitations, fatigability	Autoimmune thyroiditis presenting with transient thyrotoxicosis.
Parotid Abscess	35/M	Fever, trismus, pain over post-auricular region, increased salivation	Infective etiology distinct from thyroid/lymph node causes.
Post-Parotidectomy	40/F	Pain, tremors, palpitations following superficial parotidectomy	Illustrates iatrogenic/post-surgical complication.

These cases represent <10% of the cohort but are clinically significant due to their atypical presentations and differential diagnoses. Ages are approximate based on case records.

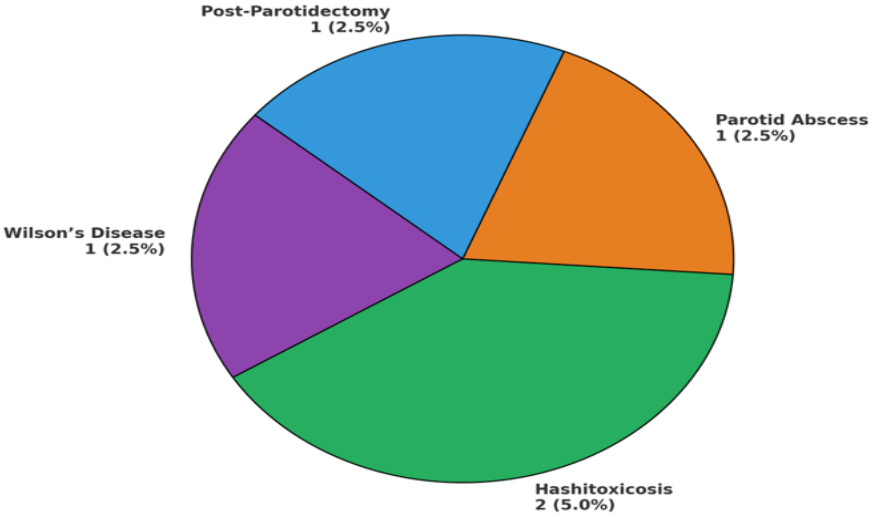

Figure 5: Distribution of Notable Rare Cases among Neck Swelling Patients

(Figure 5 breakdown of rare/unique case categories as percentages of the whole cohort, n=40.)

These rare cases highlight the heterogeneity of neck swellings:

- Wilson's disease underscores the need to consider systemic/metabolic conditions when neurological signs coexist.
- Hashitoxicosis demonstrates how autoimmune thyroiditis may present with hyperthyroid features, complicating diagnosis.
- Parotid abscess and post-parotidectomy sequelae remind clinicians of infective and iatrogenic differentials outside the thyroid spectrum.

Symptom and Diagnosis Correlations by Age and Gender

To further delineate patterns, clinical symptoms were cross-tabulated against age groups, and FNAC-based diagnoses were compared across genders.

These analyses are summarized visually in Combined Figure 6. Combined, Figure 6 Age–Symptom Heatmap and Gender–Diagnosis Correlation (n = 40)

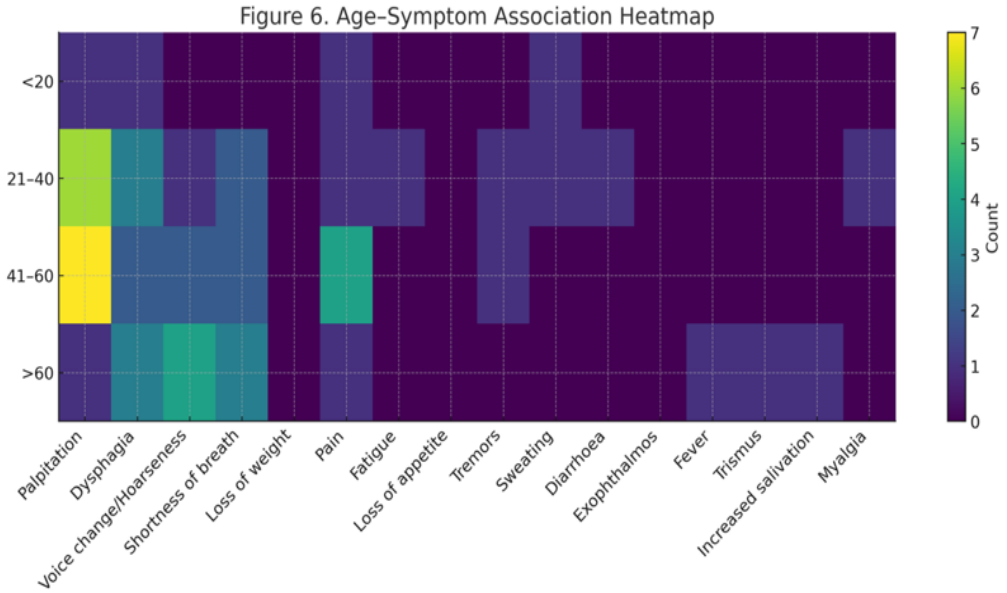

Figure 6: Age symptom association heatmap

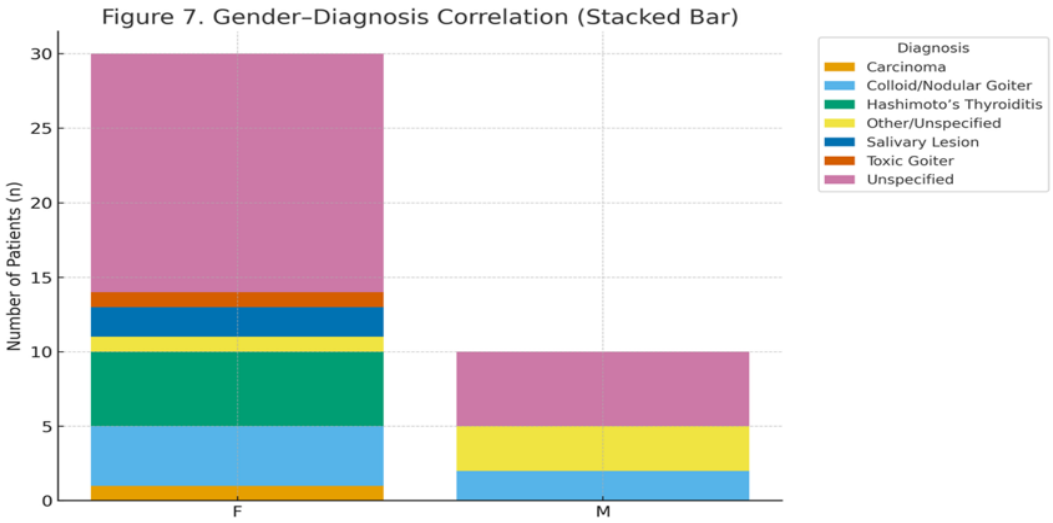

Figure 7: Gender diagnosis correlation (stacked bar)

Symptom associations were derived from free-text clinical histories, which were systematically coded into binary variables and grouped by age. FNAC results were simplified into broad diagnostic categories: benign thyroid, malignant thyroid, salivary gland, lymph node, and unspecified. The combined figure presents two perspectives. The upper panel (Figure 6) displays a heatmap showing the distribution of symptoms across different age groups, while the lower panel (Figure 7) provides a stacked bar chart that illustrates the proportions of diagnostic categories among male and female patients. Together, these visualizations emphasize the interaction of age and gender with clinical presentation and diagnosis. The Age–Symptom Association heatmap reveals that palpitations were most frequent in the 21–40 years group, reflecting thyrotoxic presentations in younger patients. Dysphagia and hoarseness became progressively more common with increasing age, particularly in the 41–60 and >60 years groups, suggesting compressive or malignant lesions in older individuals. Shortness of breath and weight loss also clustered in the older age brackets, consistent with advanced thyroid disease and malignancy. Rare features such as tremors in a patient with Wilson's disease, as well as isolated reports of trismus and increased salivation, were confined to younger or middle-aged patients.

The Gender–Diagnosis Correlation stacked bar demonstrates that females, who constituted 75% of the cohort, overwhelmingly dominated thyroid-related swellings, with colloid/nodular goiter and Hashimoto's thyroiditis being the most common diagnostic categories. Males, who made up 25% of the study population, contributed fewer cases overall but showed proportionally higher rates of non-thyroid lesions, particularly in the unspecified or possible lymph node categories. Interestingly, salivary gland lesions were observed exclusively in females, while the single carcinoma case also occurred in a female patient.

Discussion

Neck swellings represent a diverse spectrum of clinical entities ranging from benign thyroid disorders to malignant and salivary gland pathologies. In the present study of 40 patients, a clear demographic, clinical, and diagnostic pattern was observed.

The study demonstrated a marked female predominance (75%) with a female-to-male ratio of 3:1, and a median age of 48 years, consistent with previous reports that thyroid swellings are more common in women, particularly in the middle decades of life. The wide age distribution, ranging from 9 to 70 years, highlights the importance of considering neck swellings across the lifespan, including pediatric and geriatric populations where diagnostic vigilance is crucial [8].

The most frequent presenting symptom was palpitation (42.5%), followed by dysphagia (22.5%), hoarseness (17.5%), and shortness of breath (15%). These findings reaffirm the predominance of thyroid swellings and their compressive effects on adjacent structures [9]. Palpitations and tremors reflect systemic thyrotoxic states, while compressive features such as dysphagia and hoarseness increase suspicion for malignant or large goiters. Notably, rare symptoms such as fever, trismus, and increased salivation signalled parotid abscess, underscoring the heterogeneity of neck swellings [10-11]. FNAC proved invaluable in defining the diagnostic spectrum. Benign thyroid lesions (colloid goiter and Hashimoto's thyroiditis) accounted for two-thirds (65%) of cases, confirming thyroid pathology as the leading etiology. Malignancy was relatively rare (5%), yet its identification demonstrates the critical role of FNAC in screening

and triage. Salivary gland lesions (10%) and a significant proportion of unspecified cases (20%) further highlight the necessity of combining cytology with imaging and histopathology for conclusive diagnosis [12-13].

The concordance between FNAC and USG was low, with agreement in only 25.6% of cases. Discordance, observed in nearly three-quarters of cases, emphasizes the superior diagnostic reliability of FNAC compared with the often non-specific findings of USG. This aligns with literature that recommends USG primarily as an adjunct for anatomical mapping, while FNAC remains the gold standard for definitive diagnosis [14].

Rare cases, including Wilson's disease, Hashitoxicosis, parotid abscess, and post-parotidectomy complications, represented less than 10% of the cohort but had high diagnostic relevance. Such presentations illustrate the need for a broad differential diagnosis, especially when symptoms are atypical or systemic [15].

Our combined analyses revealed that younger patients were more likely to exhibit systemic hyperthyroid symptoms such as palpitations and tremors, while older patients presented with compressive or malignant features including dysphagia, hoarseness, and weight loss. Gender correlations confirmed the overwhelming burden of thyroid disease in females, while males had proportionally more non-thyroid pathologies, particularly lymph node and unspecified lesions. These findings mirror established epidemiological trends, reinforcing the value of integrating demographic patterns with clinical suspicion [4,8,15].

The study underscores the importance of a multimodal diagnostic approach. FNAC should remain the frontline investigation, supported by USG for anatomical localization and histopathology for definitive confirmation. The age–symptom and gender–diagnosis associations presented here offer practical guidance for clinicians to stratify risk and tailor diagnostic priorities. Early recognition of red flag features such as dysphagia, hoarseness, and weight loss is essential to avoid delays in identifying malignancy.

The retrospective design and relatively small sample size limit the generalizability of findings. Furthermore, not all cases had complete histopathological confirmation, restricting sensitivity and specificity analysis of FNAC. Future prospective studies with larger cohorts and standardized diagnostic pathways are warranted to validate these findings and refine diagnostic algorithms.

Conclusion

This study highlights the female predominance and middle-age peak of neck swellings, the diagnostic primacy of FNAC, and the value of demographic and clinical correlations in guiding diagnosis. While most swellings are benign thyroid lesions, rare and atypical presentations demand broad clinical awareness. Integrating age, gender, and clinical features with cytology enhances diagnostic accuracy and ensures timely intervention for malignant or unusual cases.

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Ethical statement: Institutional ethical committee accepted this study. The study was approved by the institutional human ethics committee, Annapoorana Medical College & Hospitals, Kombadipatty, Salem [AMC/IEC//Proc.No:13/2021, dated 15-05-2021]. Informed written consent was obtained from all the study participants and only those participants willing to sign the informed consent were included in the study. The risks and benefits involved in the study and the voluntary nature of participation were explained to the participants before obtaining consent. The confidentiality of the study participants was maintained.

Data Availability: All datasets generated or analyzed during this study are included in the manuscript.

Authors' contributions: Dr. Chandran S - conceptualization, data curation, investigation, methodology, project administration, visualization, writing—original draft, writing—review and editing; Dr. Karthikeyan S -conceptualization, methodology, writing—original draft, writing—review and editing; Dr. M chelladurai-methodology, writing—original draft, writing, review and editing. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript

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