e-ISSN: 0975-1556, p-ISSN:2820-2643
Available online on www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2024; 16(3); 723-730
Original Research Article

Clinicopathological Study of Neck Masses in Children

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Received: 11-01-2024 / Revised: 16-02-2024 / Accepted: 18-03-2024
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Conflict of interest: Nil

Abstract:

Background: Paediatric neck masses are a common disease entity in Otorhinolaryngology ranging from benign to malignant conditions. Most neck masses in pediatric patients are either inflammatory lesions or benign tumors but a considerable portion of pediatric neck mass constitutes malignant tumors also. To avoid fatal complications, paediatric neck masses need early diagnosis and prompt management. Paediatric neck mass can be divided into inflammatory, developmental (congenital), and tumorous lesions (either benign or malignant).

Materials and Method: A retrospective observational study including patients less than 12 years of age attending the outpatient department and those admitted to the ward in the department of Otorhinolaryngology, Assam Medical College and Hospital, Dibrugarh, Assam between August 2022 to August 2023, where neck masses were studied concerning age and sex, size and consistency of the mass and aetiology of the mass based on Clinical, Radiological, Haemalogical, Microbiological and Pathological (FNAC and HPE) correlation.

Results: A total of 60 patients were studied where Males with neck masses were more with 38(63.33%) compared to Females with neck masses with 22(36.67%). The most common presentation was of inflammatory origin with 36(60%) cases followed by benign lesions which were 10(16.67%) in number, followed by 7(11.67%) cases of congenital lesions and 6(10%) cases of malignant neck masses. The most common location was the submandibular location (30%) followed by the Carotid (26.67%) followed by midline (21.67%) and posterior triangle (15%). 35(58.33%) of the neck masses were unilateral and 12(20%) of the neck masses were bilateral. 24(40%) of neck masses were left sided and 34(56.67%) of the neck masses were right sided. On presentation, apart from neck swelling, 33.33% of masses had pain, 26.67% had fever, and 18.33% had discharge from the mass. On clinical examination, 30% of the masses elicited tenderness, 6.67% had wasting of muscles, and 16.67% were found to have restricted movement of the neck due to the mass. Neck masses are treated accordingly by conservative management for inflammatory lesions, incision, and drainage in case of abscess and surgical excision in case of congenital lesions and benign conditions. Malignant tumours are treated by chemoradiation.

Conclusion: Detailed history taking, clinical examination, radiological investigation, haematological, microbiological, and histopathological examination aid in the confirmed diagnosis of neck masses. FNAC helped diagnose cases that were not resolved by conservative treatment. Excision or incision biopsy is preferred in cases where masses exceed 4-6 weeks duration and more than 2cm in size. USG neck is the first radiological investigation to be done followed by MRI and CT to appreciate bony erosion and adhesion to nearby neurovascular bundle.

Keywords: Paediatric Neck Masses, USG neck, MRI, FNAC.

Introduction

Neck Masses are very commonly encountered in the paediatric population and they present mainly in the Otorhinolaryngology and Paediatrics department. The causes for neck masses can be subdivided into congenital, inflammatory, benign non-inflammatory, and malignant [1]. The conspicuous location and the associated cosmetic problem create anxiety for both parents and family physicians, which often result in early presentation [2,3]. On the other hand, there might be delay in presentation on the part of the attendants of the patient due to Negligence, less awareness, remote villages and unavailability of health care facilities, religious beliefs and practices and assortment to Homeopathic and Herbal medications. Although most are benign, inflammatory or of congenital origin, a high level of suspicion is necessary given that more than 10% of all biopsied masses prove to be malignant [4]. Delay in the management may lead to patients succumbing to death due to complications of neck masses.

The diagnostic process can be complex due to the wide scope of possible aetiologies, which can prolong the time for appropriate diagnosis and

treatment and worsen patients' prognosis even in cases of benign masses [5]. Therefore thorough history taking and clinical examination is essential to guide clinicians to proceed towards necessary investigations required for the diagnosis and management of Neck masses.

First step approach to neck masses in children based on clinical evaluation is to start with oral antibiotics for a duration of approximately 2 weeks. In cases which do not resolve, Fine Needle Aspiration Cytology is recommended as the diagnostic guide for selecting patients for surgery. FNAC can be done by placing the needle over big masses, and in case of tiny masses, under USG or CT guidance. Aspirated material is then sent for cytological analysis, for both gram and acid-fast stain and cultures for aerobic and anaerobic bacteria, mycobacteria, and fungal analysis. If the gram stain is positive, only bacterial cultures are done to find out the specific organism . Specific serologic tests for EBV, CMV, *Bartonella henselae* and toxoplasmosis can be done for diagnosing viral causes of neck masses. The anti-streptolysin O titre blood plasma test can be used in the diagnosis of a streptococcal infection. In cases where culture shows Mycobacteria, Sputum test and tuberculin skin test are to be done to confirm Mycobacterial infection. When FNAC is inconclusive, when the mass does not resolve beyond 4-6 week period or when the mass is greater than 2cm in size, Excisional or Incisional Biopsy is done in order to rule out malignancy.

Various advanced imaging modalities such as Ultrasound, Computed tomography (CT) and magnetic resonance imaging (MRI) are effective for non-invasive evaluation of a neck mass and its relationship to adjacent soft tissues and bony structures. An understanding of the pattern of various neck masses will improve diagnosis, preoperative decision making and their overall management [6].

Materials and Methods

It is a retrospective and observational study done in the Otorhinolaryngology department of Assam Medical College and Hospital, Dibrugarh, Assam between August 2022 to next August of 2023 including a total of 60 patients in the age group of ≤12 years, presenting with a neck mass in the outpatient department, admitted in the ward as well as those referred from the department of paediatrics for evaluation.

All the patients were evaluated by detailed history taking, systemic and local examination. Hospital files were analyzed to retrieve data on signs and symptoms; microbiology reports; operation notes; and blood investigation parameters, ultrasonography (US), computed tomography (CT), and magnetic resonance imaging (MRI) scan characteristics; results of diagnostic fine-needle aspiration (FNAC); incisional, and excisional biopsies.

After obtaining data on above mentioned criteria, neck masses were classified based on age and sex distribution, on the anatomical location of the mass in the neck into anterior, posterior triangles or midline; based on size and consistency of the mass, based on clinical symptoms at the time of presentation and according to aeitology of neck masses.

Results

Table 1: sex distribution according to age of patients

Age group	Male	Female	Total
0-3	8(21.05%)	3(13.63%)	11(18.33%)
4-6	5(13.15%)	3(13.63%)	8(13.33%)
7-9	15(39.47%)	10(45.45%)	25(41.67%)
10-12	10(26.31%)	6(27.27%)	16(26.67%)
Total	38(63.33%)	22(36.67%)	60(100%)

According to the above results, males with neck masses were more in number with 38(63.33%) compared to females with neck masses with 22(36.67%) with male to female ratio of 1.7:1 . Among them, males with a maximum number of 15(39.47%) were in the age group of 7-9 years, followed by 10(26.31%) in the age group of 10-12 years. Similarly, Females were the maximum in number with 10(45.45%) in the age group of 7-9 years followed by 6(27.27%) in the 10-12 age group. Therefore paediatric patients with neck masses were more common in the 7-12 years age group.

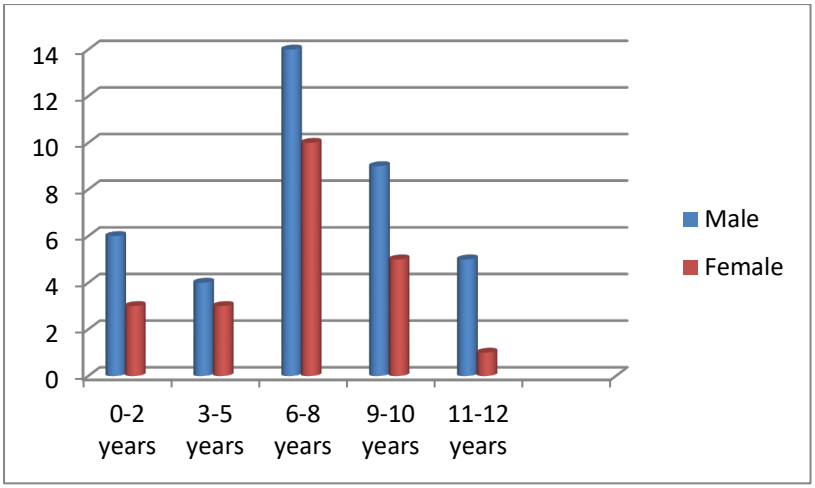


Table 2: according to clinical presentation

Clinical Presentation	Number
Symptoms	
Neck swelling	60(100%)
Pain	20(33.33%)
Discharge	11(18.33%)
Fever	16(26.67%)
Weight loss	6(10%)
Signs	
Neck mass	60(100%)
Tenderness	18(30%)
Discharge	11(18.33%)
Restricted movement	10(16.67%)
Fever	16(26.67%)
Wasting of neck muscles	4(6.67%)

Out of all patients presenting to the Otorhinolaryngology department with a neck mass, 20(33.33%) complained of pain, 16(26.67%) presented with fever, 6(10%) presented with weight loss, and 11(18.33%) presented with discharge from the mass. On examination, tenderness was elicited in 18(30%) of patients, restricted movement of the neck was observed in 10(16.67%) and muscle wasting was noted in 4(6.67%) of patients.

Table 3: size and consistency of the neck mass (based on clinical and ultrasonographic evaluation)

Size of the mass	N	Solid	Cystic	Mixed
<2cm	28(46.67%)	24(85.18%)		4(14.81%)
2-4cm	29(48.33%)	7(24.14%)	19(65.51%)	3(10.34%)
>4cm	3(5%)		3(100%)	
Total	60(100%)	31(51.67%)	22(36.67%)	7(11.67%)

The above table shows the distribution of neck masses according to size and consistency. In case of multiple swellings, the largest swelling was taken into account for assessment. A maximum number of neck masses i.e., 29(48.33%) were 2-4cm in size, out of which 7(24.14%) were solid, 19(65.51%) were cystic and 3(10.34%) were mixed. The next in number are masses in the size range of 1-2cm, 28(46.67%) of the masses, out of which 24(85.18%) were solid and 4(14.81%) were mixed. 3(5%) of the masses were more than 4 cm in size which were cystic. The size of the neck masses was documented by an approximation by manual measurement and partly by Ultrasonographic estimation. USG findings were used as a confirmatory tool for assessing the consistency of neck masses.

Table 4: aetiology based on clinical, microbiological and pathological workup

Aetiology	N
Inflammatory Lesions	36(60%)
Reactive Lymphadenitis	16(26.67%)
Neck Abscess	14(23.33%)
Granulomatous lymphadenitis	4(6.67%)

Chronic Sialedenitis	2(3.33%)
Congenital Lesions	7(11.67%)
Thyroglossal cyst	2(3.33%)
Cystic Hygroma	2(3.33%)
Dermoid cyst	2(3.33%)
Branchial cleft cyst	1(1.67%)
Benign Lesions	10(16.67%)
Epidermoid cyst	2(3.33%)
Pleomorphic adenoma	2(3.33%)
Plunging Ranula	2(3.33%)
Solitary Thyroid Nodule	2(3.33%)
Haemangioma	1(1.67%)
Fibroma	1(1.67%)
Malignant Lesions	6(10%)
Hodgkin's Lymphoma	2(3.33%)
Non- Hodgkin's Lymphoma	1(1.67%)
Acute Lymphoblastic Leukaemia	1(1.67%)
Langerhan cell histiocytosis	1(1.67%)
Papillary carcinoma thyroid	1(1.67%)
TRAUMATIC LESIONS	1(1.67%)
Haematoma	1(1.67%)
Total	60(100%)

Among the neck masses, the most common presentation was of inflammatory origin with 36(60%) cases followed by benign lesions which were 10(16.67%) in number followed by 7(11.67%) cases of congenital lesions and 6(10%) cases of malignant neck masses.

Out of the inflammatory lesions, reactive lymphadenitis was most common with 16(26.67%) followed by 14(23.33%) of neck abscess patients. Granulomatous lymphadenitis is mainly due to Tuberculosis which was found in 4(6.67%)of patients and Chronis sialedenitis of submandibular gland was found in 2(3.33%) patients. Among the congenital lesions, Thyroglossal cyst was 3.33% with an equal number of Dermoid cyst and Cystic Hygroma cases. Branchial cleft cyst patients were 1.67%. Among the benign conditions, there were an equal number of Epidermoid cysts, Pleomorphic adenoma, Plunging Ranula, and Solitary Thyroid Nodules with 3.33% each. Among the Malignant conditions, Hodgkin's Lymphoma was 3.33 %. Non-Hodgkin's Lymphoma, Acute Lymphoblastic Leukaemia, Langerhan Cell Histiocytosis, and Papillary Thyroid Carcinoma were equal in distribution with 1.67%.

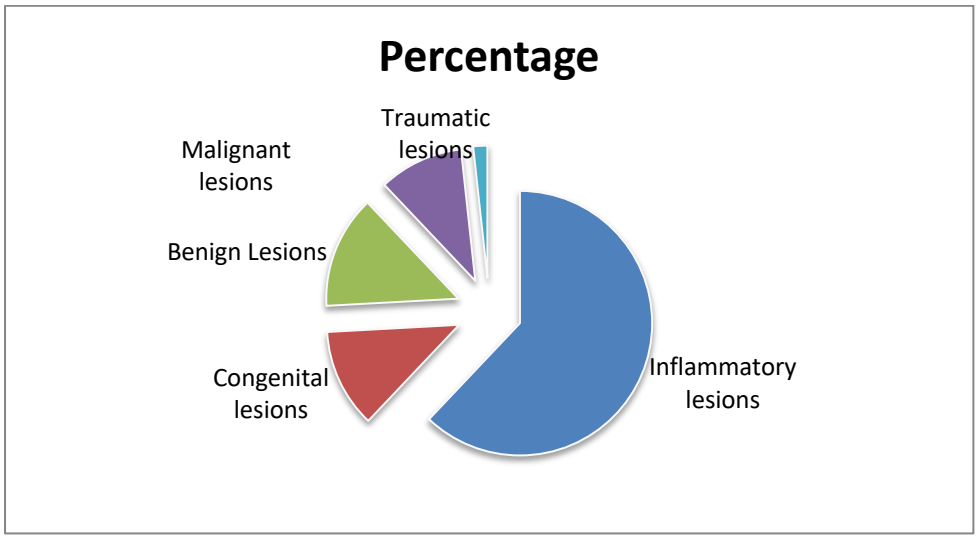
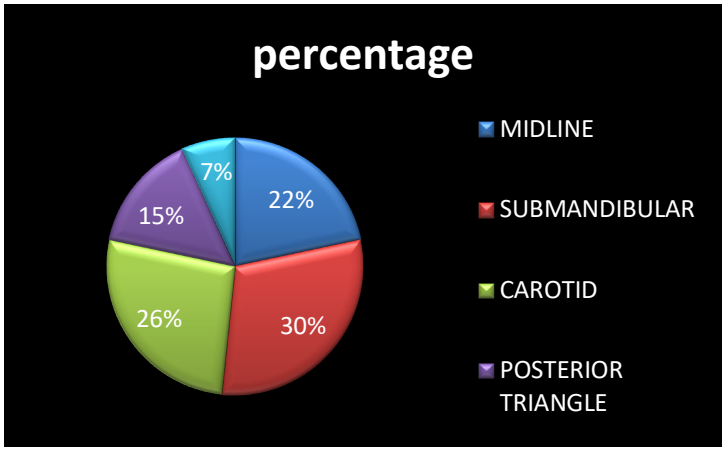


Table 5: Anatomical site of swelling

Aetiology	Midline	Lateral				Unilateral	Bilateral	Left	Right
		Submandibular	Carotid	Posterior Triangle	Parotid region				
Reactive Adenopathy	2	6	4	2	2	9	5	8	11
Neck Abscess	3	5	6			11		5	6
Granulomatous lymphadenitis		2	2				4	4	4
Chronic Sialedenitis		2				2			2
Thyroglossal cyst	2								
Cystic Hygroma				2		2		1	1
Dermoid cyst	2								
Branchial cleft cyst			1			1			1
Epidermoid cyst	1	1		1		2			2
Pleomorphic adenoma					2	2		1	1
Plunging Ranula		2				2			2
Haemangioma			1			1			1
Fibroma	1								
Solitary Thyroid nodule			1			1		1	
Hodgkin's Lymphoma			1	1		1	1	1	1
Non- Hodgkin's Lymphoma				1			1	1	1
Acute Lymphoblastic Leukaemia				1			1	1	1
Langerhan Cell Histiocytosis				1		1		1	
Papillary Thyroid Carcinoma	1								
Haematoma	1								
Total	13(21.67%)	18(30%)	16(26.67%)	9(15%)	4(6.67%)	35(58.33%)	12(20%)	24(40%)	34(56.67%)

According to the anatomical location of swelling, the most common location was submandibular location 18(30%) followed by Carotid 16(26.67%) followed by midline 13(21.67%), and Posterior Triangle 9(15%). Parotid swelling was 4(6.67%). 35(58.33%) of the neck masses were unilateral and 12(20%) of the neck masses were bilateral. 24(40%) of neck masses were left sided and 34(56.67%) of the neck masses were right sided. Most of the neck masses were unilateral except Tubercular Lymphadenitis which presented with bilateral and multiple neck nodes occupying more than one anatomical site. Hodgkin's Lymphoma, Non-Hodgkin's Lymphoma, and Acute Lymphoblastic Leukaemia also showed bilateral and multiple neck node presentation. A few cases of Reactive Lymphadenitis were present in more than one anatomical site.



Discussion

It was a retrospective and observational study done in the Department of Otorhinolaryngology, Assam Medical College and Hospital, Dibrugarh, Assam, including 60 patients presenting with neck mass in the department between August 2022 to August 2023. The study was done by considering the salient points like age and sex distribution of patients with neck masses, clinical features at the time of presentation, sizes of the neck masses and characteristics of mass, etiology based on histopathological examination of the mass and distribution of the masses based on anatomical location.

The male-to-female ratio was 1.7:1 with 63.33% of male patients and 36.67% of female patients. Similarly, in the study done by Gangwar N et. al., males were 58% and females 42%7.

All the patients underwent necessary blood investigations like Complete Blood Counts(CBC), Erythrocyte Sedimentation Rate(ESR), C-reactive Protein(CRP), Renal Function tests, and Serum Lactate Dehydrogenase(LDH) levels. Raised total white cell count and neutrophilia are found in bacterial infections like abscesses and infective lymphadenitis, whereas cytopenia was seen in Malignant lesions. Thrombocytosis was noted in patients with reactive cervical lymphadenitis. The Peripheral Blood Film revealed blast cells in cases of Acute Lymphoblastic Leukemia. CBC along with ESR and CRP were found raised in infective and inflammatory conditions. Pancytopenia may indicate Leukemia. LDH and Uric Acid levels were found to rise in Malignant conditions like Lymphoma. 49(81.67%) of the neck masses were sent for USG neck which is the first investigation to be done in patients with neck masses as it is less invasive and does not use harmful radiations. USG neck helped in eliciting the neck masses based on size and consistency of mass as solid, cystic, or mixed. [7]

Fine Needle Aspiration Cytology was done in 32(53.33%) patients with acquired neck masses that could not be diagnosed accurately by USG neck. FNAC could diagnose almost all cases of neck masses. Excision Biopsy was conducted in 4 of the cases where FNAC was inconclusive and malignancy was most like due to the characteristics of the mass. If there is any suspicion of malignancy or in cases of persistent lymphadenopathy, an excisional biopsy with microscopic examination of the lymph node should be performed according to the study done by AK Lueng [8]. Excisional biopsy is still the gold standard because in children fine-needle biopsy is difficult to perform and can be accepted as accurate in positive findings only [9], according to a study performed by Huyett et al., [10]. FNAC was inconclusive in diagnosing 8.9% of pediatric neck masses. In the same study, the sensitivity and specificity of FNAC were reported as 93.5% and 64.3%, respectively. Though FNAC can identify atypical cells, it cannot identify subtypes of lymphoma [11].

In this study, the most common presentation was of inflammatory origin with 60% cases followed by benign lesions which were 16.67% in number followed by 11.67% cases of congenial and 10% cases of malignant neck masses which are similar to the results concluded in the study by Al Mayoof et. al., [12]. The most common inflammatory neck mass was reactive lymphadenitis with 30% which is similar to the findings of Ahuja AT et. al.,[13]. Cervical Lymphadenopathy in the paediatric population can be attributed due to causes mentioned in Table 6 [14,15]

Reactive

lymph nodes were managed conservatively by a course of antibiotics for 2-3 weeks. Persistent reactive lymph nodes were removed by total excision along with the capsule. Tubercular lymphadenitis was found more in females in this study. On confirmation of tuberculosis, patients were put on ATT for 6 months which extended for a further period depending on the drug resistance of mycobacterial organism. Neck abscess due to infective etiology and tubercular neck abscess both went through Incision and Drainage as definitive management, and the pus was sent for culture of organism and sensitivity to antibiotic analysis.

The Benign cases of neck masses were more in number than congenital cases. Whereas in other studies Congenital neck masses were more commonly encountered as reported by other authors [16,17]. Congenital conditions like Thyroglossal cyst, Dermoid cyst, Branchial cleft cyst, and Cystic Hygroma were treated by excision followed by post-operative physiotherapy to regain normal neck movements. Thyroglossal cysts were removed by Sistrunk operation. Other benign conditions like Fibroma, Haemangioma, Lymphangioma, and Plunging Ranula were treated by excision after ruling out a compromise of vital structures nearby.

Malignant lesions encountered in this study were Hodgkin's Lymphoma(3.33%),Non-Hodgkin's Lymphoma(1.67%), Acute Lymphoblastic Leukemia(1.67%), Langerhan Cell Histiocytosis(1.67%) and Papillary carcinoma thyroid(1.67%),. Malignant lesions in this study were the least common etiology similar to studies by other authors. On the contrary Osifo OD et al., [18] found 57.1% of malignant cases in their study which resulted in 5.75% overall mortality due to late presentation. In case of suspected malignancy, an excision biopsy is to be performed and CT/ MRI done to rule out adjacent bony erosion and adhesion to neurovascular bundle and for Grading and

Staging of the malignant mass. According to the Staging of the disease, lymphomas are either excised or managed by a combination of chemotherapy and Radiotherapy. Langerhans Cell Histiocytosis was treated by Chemotherapy and

Oral Steroid therapy. The Papillary Thyroid Carcinoma patient underwent Hemithyroidectomy of the involved lobe followed by Radioiodine Therapy. In this study, the patients with malignant masses were referred to the departments of Surgical and Medical Oncology and Radiotherapy, for further management of the disease.

The location of the mass aid is predominantly in diagnosis. A midline location is a typical feature of congenital conditions like thyroglossal and dermoid cysts. Branchial cysts, Cystic Hygroma, and vascular/lymphatic malformations are more commonly found in the lateral neck, over the Posterior Triangle. The incidence of malignancy was higher in masses localized posterior to the sternocleidomastoid muscle (SCM) when compared with the anterior aspect of the SCM [19]. In this study, the most common location of paediatric neck mass was the submandibular location (30%) followed by the Carotid (26.67%) followed by the midline (21.67%), and posterior triangle (15%) and the least common was Parotid location with 6.67%. 58.33% of neck masses were unilateral and 20% were bilateral. 40% of neck masses were left-sided and 56.67% of the neck masses were right-sided. In the study done by Ozem et.al., [20], The most frequent were lateral neck masses (levels 2, 3, and 4), followed by midline, submandibular, and posterior cervical localizations.

Conclusion

Neck masses in paediatric patients are very common and through the stepwise approach of detailed history taking, clinical examination, biochemical, microbiological, haematological radiological and histopathological examination, accurate diagnosis can be done. FNAC is the first choice investigation to be done in case masses do not resolve after conservative management. USG neck is the first radiological

investigation to be done, as it is non-invasive. Reactive Lymphadenopathy was the most common paediatric neck swelling followed by Neck abscesses due to infective aetiology. Benign conditions were next in common followed by congenital lesions. Malignant neck masses were least commonly encountered in this study and no cases of metastatic cervical lymph node due to a primary tumour elsewhere were seen. The choice of investigation to be taken up primarily depends on the clinical presentation of the patient with neck masses keeping in mind the various differential diagnoses.

Declarations

Funding: none

Ethical approval: Ethically approved.

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