ORIGINAL RESEARCH

The frequency and distribution of pediatric chest mass lesions: A retrospective cross-sectional radiological analysis

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ABSTRACT

Objective: The main objective of the study is to find the frequency and distribution of pediatric chest mass lesions. **Methodology:** This retrospective study was conducted on 110 patients, ranging in age from newborns to 18 years. All the patients were referred for imaging for respiratory or systemic signs and symptoms suggesting intrathoracic pathology, or had asymptomatic chest masses detected during evaluations for other diseases not related to the chest. Information was obtained from patients' medical records, radiology reports, and where available from, histopathology and surgical notes. **Results:** Data were collected from 110 patients shows a higher incidence of chest mass lesions in children aged 6–10 years (31.8%) and the lowest in those aged 11–18 years (18.2%). Gender distribution is relatively balanced, with a slight male predominance (54.5%). Respiratory symptoms are the most common clinical presentation (40%), followed by non-specific symptoms such as fever and fatigue (25%), while 20% of cases were asymptomatic and discovered incidentally. The findings show that solid lesions are the most prevalent type of pediatric chest masses, representing 50% of cases, followed by cystic lesions at 27.3%, and mixed lesions at 13.6%. **Conclusion:** It is concluded that pediatric chest mass lesions, while predominantly benign, require age-specific diagnostic attention due to the distinct distribution of congenital and malignant types across age groups.

INTRODUCTION

Pediatric chest mass lesions, while uncommon, are clinically significant due to their wide-ranging implications on respiratory function and overall health in children. These lesions can present with different etiology and clinical manifesting, may be require different approach to management. These can encompass neoplastic and non-neoplastic pathology that can be malignant or benign featuring congenital cystic lesions, inflammatory masses, neurogenic tumors, and lymphomas [1]. An early detection is important because behavior disorders affects growth, development and quality of life of children. This highlights the need to know the prevalence and distribution of these lesions in order to help the physicians decision when it comes to diagnosis or even treatment options in undertaking the same [2]. Over the last decade, refinements in diagnostic imaging especially in visual techniques such as CT, MRI, and ultrasound have enhanced ability to diagnose and describe pediatric chest masses. These tools has helped the health care practitioners toevaluate in a non invasive approach the severity of these lesion and degree of differentiation between benign and malignant diseases. However, these wide spectrums of pediatric chest masses continue to pose a challenge in their interpretation; a decision may involve the services of radiologist, pediatric surgeons or oncologists. The purpose of the current investigation is to evaluate various uses and cooperation of these means to involve and diagnose chest masses in children [3].

Age distribution of pediatric chest mass lesions is also another important aspect of research alongside their relationship with certain symptoms. For instance, a number of neonatal and infant cases are likely to exhibit congenital lesions such as bronchopulmonary sequestration and congenital cystic adenomatoid malformation (CCAM) [4]. While infants may develop more common cancers such as leukacemia,

older children may suffer from neoplastic growths such as lymphomas and neuroblastomas. Assessing these age-related distributions is essential for the analysis of the chest masses' etiology in children and for setting the age-adapted diagnostic algorithms [5]. Symptomatically, children with chest masses may experience any respiratory and systemic complaint from cough and shortness of breath to chest pain, fever, or finding incidentally on a plain film request. One of the major challenges in diagnosing COVID 19 at the early stage is the fact that several symptoms may mimic classical pediatric respiratory illnesses [6]. Moreover, some lesions may not be symptomatic and are found sometimes after a long time when the patient presents with other disease conditions during imaging. Thus, aiming to define tendencies in relation to symptom patterns and lesion morphology might enhance clinical concern and early recognition for the increase-risk lesions with more malignant pathological outcomes [7].

Other areas that need research pertains childhood chest mass lesions practically in the epidemiology area, this ranges from the studies on the geographical distribution of this disease, gender and genetics among children. The prior literature has identified possibly environmental and genetic conditions that may be connected with the development of specific kinds of chest masses [8]. For instance, congenital chest lesions are associated generally with developmental abnormalities during gestation, whereas environmental influence and family history may be potential causes for neoplastic mass formation. Knowledge of these epidemiological characteristics may thus provide important clues as to preventive strategies in at-risk groups and optimal time for screening [9]. Management of chest mass lesions in a child heavily depends on the type and location of the tumor and the general condition of the child. Surgical removal is still used in many forms of lesion, mainly those that are for symptom relief, or have potential for cancerous transformation. New methods of treatment with minimal invasiveness including thoracoscopic surgery are often applied to decrease postoperative morbidity and time for recovery [10]. If malignancy is identified, chemotherapy and radiation may be required, and approaches are adjusted to reduce the adverse effects on developing youth. Evaluation of results of such treatment methods is crucial for identifying high standard and appropriate care approaches to paediatric oncology and thoracic surgery [11].

OBJECTIVE

The main objective of the study is to find the frequency and distribution of pediatric chest mass lesions.

METHODOLOGY

This retrospective study was conducted at----------
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--------. A total of 110 patients, ranging in age from newborns to 18 years, were included. All the patients were referred for imaging for respiratory or systemic signs and symptoms suggesting intrathoracic pathology, or had asymptomatic chest masses detected during evaluations for other diseases not related to the chest. Information was obtained from patients' medical records, radiology reports, and where available from, histopathology and surgical notes. Patients were included in the study if they met the following criteria: Group A included individuals; (1) patients up to 18 years of age (2) Patients with imaging evidence of a chest lesion such as a CT, MRI or ultrasound (3) Follow-up records completed with sufficient diagnostic data and, where available, histopathological data. Patient records were excluded if the imaging they had was not complete, if imaging findings were indeterminate or if their pathology was not chest related.

Data Collection

Demographic information, clinical presentation, imaging findings, and, where available, histopathology reports were collected. Key variables included age at diagnosis, gender, presenting symptoms, imaging modality used, lesion type, size, and location. For each case, imaging reports were reviewed by a pediatric radiologist to verify the lesion characteristics and ensure consistency in lesion classification.Initial imaging was typically performed using chest X-rays, followed by more specific imaging modalities, such as CT and MRI, to gain detailed insights into the lesion's size, structure, and involvement of surrounding anatomical structures. Ultrasound was used sparingly mainly for easily reaching, cutaneous tumor lesions or any requiring real-time guide during the biopsy process. Where the tumor was thought to be malignant, tissue biopsy was done and histopathologic results obtained to determine the malignancy. The lesions were first separated according to their anatomic location whether it was mediastinal, pulmonary, pleural or chest wall lesion, and whether they given was benign lesion or malignant lesion. Congenital lesions including bronchopulmonary sequestration, congenital cystic adenomatoid malformation (CCAM) and neurogenic tumours were included in a separate category. Benign tumours were present in metastatic form, such as lymphomas, neuroblastomas and sarcomas etc. Retrospective lesion classification was done by specialists that included radiologists, pediatric surgeons, and oncologists.

Statistical Analysis

Descriptive statistics were applied to analyze the data. Frequency distribution was used to determine the prevalence of different lesion types and their distribution across various age groups.

RESULTS

Data were collected from 110 patientsshows a higher incidence of chest mass lesions in children aged 6–10 years (31.8%) and the lowest in those aged 11–18 years (18.2%). Gender distribution is relatively balanced, with a slight male predominance (54.5%). Respiratory symptoms are the most common clinical presentation (40%), followed by non-specific symptoms such as fever and fatigue (25%), while 20% of cases were asymptomatic and discovered incidentally.

Table 1: Demographics Data

Category	Subcategory	Number of Patients	Percentage
Age Group	0–2 years	30	27.3
	3–5 years	25	22.7
	6–10 years	35	31.8
	11–18 years	20	18.2
Gender Distribution	Male	60	54.5
	Female	50	45.5
Clinical Presentation	Respiratory symptoms	44	40.0
	Non-specific symptoms	28	25.0
	Chest pain	16	15.0
	Asymptomatic	22	20.0

Pulmonary lesions are the most common among pediatric chest masses, accounting for 40.9% of cases, followed by mediastinal lesions at 31.8%, with pleural and chest wall lesions being less prevalent (18.2% and 9.1%, respectively). Lesion classification reveals a majority of benign cases (63.6%), though a significant portion (36.4%) are malignant.

Table 2: Lesion Distribution by Location and classification

Category	Subcategory	Number of Patients	Percentage
Lesion Distribution by Location	Pulmonary Lesions	45	40.9
	Mediastinal Lesions	35	31.8
	Pleural Lesions	20	18.2
	Chest Wall Lesions	10	9.1
Lesion Classification	Benign	70	63.6
	Malignant	40	36.4

The findings show that solid lesions are the most prevalent type of pediatric chest masses, representing 50% of cases, followed by cystic lesions at 27.3%, and mixed lesions at 13.6%. This distribution suggests that solid masses should be a primary consideration in diagnosis, while the presence of cystic or mixed characteristics may require additional imaging and assessment to accurately determine the nature and appropriate management of these lesions.

Table 3: Imaging Characteristics

Characteristics	Number of Patients	Percentage
Solid Lesions	55	50.0
Cystic Lesions	30	27.3
Mixed Lesions	15	13.6

The treatment data indicates that surgical resection is the most common approach, applied in 54.5% of cases, reflecting its role in managing symptomatic or potentially malignant chest masses. Non-surgical management, chosen for 27.3% of patients, was primarily used for benign or asymptomatic lesions, while chemotherapy or radiation was administered to 18.2% of patients, predominantly those with malignant diagnoses.

Table 4: Treatment and Outcomes

Treatment Type	Number of Patients	Percentage
Surgical Resection	60	54.5
Non-Surgical Management	30	27.3
Chemotherapy/Radiation	20	18.2

DISCUSSION

The data indicate a predominance of benign lesions, with a higher occurrence of pulmonary and mediastinal masses compared to pleural and chest wall lesions. These trends are supported by research by literature; benign disorders like congenital abnormalities and inflammatory masses embrace a larger portion of childhood as compared to tumors that are malignant [12]. Nevertheless, a significant percentage (36.4%) of the cases were malignant and this is why constant diagnostic examination in patients of increased risk age is crucial. The distribution by age identified in this study raises the importance of congenital chest lesions in children under five years old and the rise of malignant tumours, including lymphomas and neuroblastomas, in older children and adolescents [13]. This pattern may be attributed to the fact that congenital lesions result from developmental problems, which present themselves early in the child's development while neoplastic lesions are relatively slower and start presenting themselves as the child grows older. Such observations affirm that there is a need for the application of age-standardized screening procedures [14]. Further, patients with chest masses that present at a younger age should be considered to possibly have congenital etiologies, while older patients with chest masses should should be considered more likely to have malignancies. The clinical manifestations of chest mass in children were multifaceted, but the simplest and most recurrent symptoms of the chest mass were respiratory; other symptoms included fever and chest pain [15]. In another, slightly more than half of the patients; lesions were diagnosed though the patient did not present with signs and symptoms. This asymptomatic group is of particular diagnostic interest because, similar to other asymptomatic patients with joint hypermobility, they are unlikely to benefit from routine imaging in pediatric practice [16]. Therefore, any abnormality seen in imaging done for another pathology should be followed up, especially in a triangular or an initial mass. Also, the clinical distinction between benign and malignant disease is not always easy because some signs and symptoms are the same and delay the diagnosis or produce invasive treatments superfluous. Imaging, and to a larger extent, CXR, CT, and MRI, were discovered to play a dynamic role in deciding and describing chest lesion manifestation in children. Each modality offers specific advantages: X-rays give an idea to the outside world of the situation while CT and MRI, which are more sensitive provide detailed clear-cut sections necessary in defining the margins and nature of the lesion [17]. Because imaging characteristics are so diverse; that is, the nature of the masses is solid, cystic or mixed; therefore, a combination imaging strategy is helpful in providing the foundation of a diagnostic framework of pediatric chest masses. Minimative intervention was used in children with small, benign or incidentaloma masses while conservative management was recommended for asymptomatic pediatric patients by paying attention to the observation that optimum management of these lesions was between radicalism and conservatism [18]. Chemotherapy or radiation as in malignant cases drive the point of the surgery, oncology and radiology departments in order to achieve effective integration of care that does not limit the long-term development of the child [19]. Despite these findings, the present research has a few drawbacks in this regard, they are as follows: The study is retrospective and is based on chart abstraction of diagnosed cases, a resource that may not provide standardized follow-up data. OP also, the size of the participants in the study limited the ability to generalize results in the broader pediatric population. Subsequent studies should utilize greater patient and specimen numbers from multiple institutions and should also gather longer term outcomes data.

CONCLUSION

It is concluded that pediatric chest mass lesions, while predominantly benign, require age-specific diagnostic attention due to the distinct distribution of congenital and malignant types across age groups. Imaging plays a critical role in early detection and characterization, aiding in effective management. Multidisciplinary approaches are essential for optimizing outcomes and ensuring comprehensive care for pediatric patients with chest masses.

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