

## Original Article

### Assessment of Chest Pain in the Pediatric Age Group: The Family Physician's View

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#### Abstract

Our aim was to determine the main causes of acute chest pain and the approachment in the pediatric age group patient. Although a lower percentage of organic origin for the chest pain was found, it is mostly underappreciated during primary care visit and remains unreported. Our study is a review compiling the literature. Evaluation of the chest pain depends on mainly thorough and thoughtful history and physical examination of the patient. Evidences of cardiac event and risk factors could design the settlement for therapy and prognosis. Main cause of acute chest pain is musculoskeletal chest wall pain in 80% of patients. Pulmonary causes follow it with 13%, psychological causes 9%, cardiac causes 5%, trauma 5% and finally gastrointestinal causes 4%. Chest pain in childhood is usually of benign causes. The most common cause is chest wall pain. Routine ECG and chest radiograph is useful for diagnosis. Other causes are pulmonary or psychological, gastrointestinal. Reassurance of the patient and of their families is also important when a noncardiac cause is determined.

**Key Words:** Chest pain, Children, Family Medicine.

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#### Introduction

Chest pain is a common complaint among children of all ages during primary care visit<sup>1</sup>. Meanwhile, the extent of the chest pain complaint is unclear or this complaint is underappreciated by primary care physician. Thus, this subject must be well known by family physicians and primary care givers.

Chest pain is a frequent presentation in pediatric emergency departments and the second most common reason for referral to pediatric cardiologists<sup>2</sup>. Annually in the United States, about 600,000 individuals between the ages of 10 and 21 years see a physician for complaints of chest pain<sup>3</sup>. Emergency department visits among 0-17 years old patients was found 26 cases per ten thousand population for all races in USA between 2003-2005. Furthermore, this rate was found 50 cases per ten thousand population for blacks in the same period<sup>4</sup>. Even infrequently resulting from a cardiac disease, an accurate, detailed and

thorough history and physical examination is the most appropriate approach to these patients. Chest pain is an overwhelming problem, which persists for months and even years following medical evaluation<sup>5</sup>. This is a review of literature based on MEDLINE, ELSEVIER SCIENCE DIRECT and COCHRANE Databases.

Because the literature regarding this subject was not enormous in the world, we aimed to emphasize the importance of chest pain especially for the family physicians.

#### History and physical examination:

In general, almost all of authors denote this symptom as of a noncardiac origin in literature. However, careful and thorough history is a mainstay of an appropriate diagnosis<sup>6</sup>. When a strong family history of coronary artery disease or personal history of coronary risk factors is present, it should be taken into consideration. The acute onset of chest pain, interference with sleep, precipitation by exercise or association with dizziness, palpitation, syncope or shortness of breath should indicate an organic origin<sup>5</sup>. In addition, chest pain can create some psychological aspects so that adolescent with chest pain could feel himself less healthy compared to their peers. 68 % of those with the symptom

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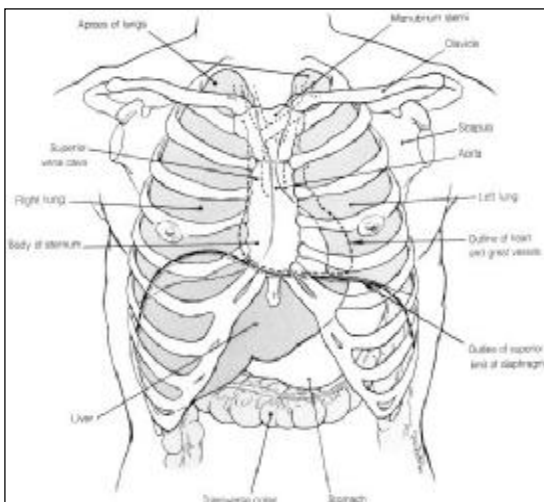
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associated their illness to heart disease and 44 % altered their behavior because of it<sup>7,8</sup>. It could be physically and emotionally distressing symptom.

The time course of the pain and localization has a good importance. Generally, it is localized on the left precordium with no radiation. No correlation has been found between duration of symptoms prior to the clinical study and persistence of chest pain at follow-up<sup>9</sup>. Physical signs like fever, respiratory distress, abnormal breath sounds, cardiac murmur, abnormal rhythm or heart sounds, and palpable subcutaneous air should be sought carefully<sup>5</sup>. These findings frequently indicate a major problem. Therefore, the main goal is to exclude rare and life-threatening causes of chest pain. Immediate evaluation, treatment and subspecialty consultation is required<sup>10</sup>. Even though laboratory testing may be non-diagnostic, costly and burdensome to patient, chest radiograph and electrocardiogram continues to be valuable tools for the pediatric cardiologist in the evaluation of patients with heart murmurs or chest pain<sup>11,12</sup>.

#### General causes of chest pain in the pediatric age group:

Chest pain rarely indicates a serious cardiac problem<sup>13-16</sup> (Table 1). Chest pain in younger age patients tends to have a higher percentage of organic disease whereas in adolescents, idiopathic or psychogenic<sup>5</sup>. Usually chest wall pain is also called musculoskeletal or costochondral pain which is observed in 80 % of the patients. The rest of the reasons are pulmonary in 13 %, psychological in 9 %, cardiac in 5 %, traumatic in 5 %, gastrointestinal in 4 % of cases<sup>17</sup> (Figure 1).



**Figure 1-** Overview of anatomic structures generating chest pain (thoracic cage itself, thoracic and abdominal organs) (Adapted from: Cava JR, Sayger PL. Chest pain in children and adolescents. *Pediatr Clin N Am*, 2004, 51: 1555)<sup>1</sup>

Kaden et al.<sup>8</sup> found that cardiac conditions constituted 12% of chest pain. In the study by Fyfe and Moodie<sup>18</sup>, cardiac etiology was found in only 6% of those suffering from chest pain.

#### Musculoskeletal origin:

Idiopathic chest pain is generally of musculoskeletal origin. It tends to be self-limited<sup>7,19-22</sup>. Slipping Rib Syndrome is also a cause of chest pain where inadequacy or rupture of the interchondral fibrous attachments of the anterior ribs allows the costal cartilage tips to sublux, impinging on the intercostal nerves<sup>23,24</sup>. Furthermore, precordial catch syndrome or Texidor's twinge, is characterized by a well-localized sharp pain on the precordium. Its duration lasts only seconds to minutes. The patient usually sits straight up in order to reduce pain and posture type is important<sup>25</sup>. Its etiology is unknown.

#### Pulmonary causes:

The reported incidence of exercise-induced asthma in children with chest pain seems greater than expected<sup>26</sup>. Pain and respiratory symptoms relieve quickly with rest. Pneumonia can present with chest pain, respiratory symptoms and fever. Chest pain was presented in pneumothorax and pneumomediastinum too. In pneumothorax, the pain is unrelenting. In pneumomediastinum, chest pain is usually observed with often dysphagia and subcutaneous emphysema<sup>27</sup>. Within the pulmonary causes of chest pain, acute chest syndrome also should be thought in a sickle cell anemia patient<sup>28</sup>. Occasionally thoracic amebiasis is found as origin particularly in low socioeconomic conditions and low hygienic regions<sup>10</sup>.

#### Psychogenic and idiopathic origins:

Most chest pain in the young is of psychological origin. In a study of 408 patients addressed to the Emergency Department with a complaint of chest pain, fatigue, dizziness and hyperventilation, depression was found the main cause in 4.2 % of patients<sup>29,30</sup>. In addition, anxiety, conversion disorder was found as psychiatric origin. There is a powerful cross-sectional relationship between psychiatric disorder and exertional chest pain<sup>31</sup>.

#### Cardiac diseases as a cause:

Chest pain referable to the cardiovascular system is generally caused by congenital heart diseases. Also Kawasaki and Marfan syndromes, supraventricular tachycardia, syncope, left ventricular outflow obstruction, hypertrophic cardiomyopathy, aortic stenosis, anomalous coronary arteries, prolonged QT syndrome, pericarditis, myocarditis, rheumatic fever and endocarditis should be reviewed among the acquired causes<sup>33-5</sup>. Hypertrophic cardiomyopathy is a sudden death cause. Any pathologic murmur

found in the evaluation of chest pain needs referral. Kaden et al.<sup>8</sup> found supraventricular tachycardia to be the most frequent reason for chest pain. Coronary vasospasm and ischemic diseases were usually occurred in adolescent age group. Pain property is crushing, diffuse and unrelenting. Diaphoresis, nausea, dyspnea, and syncope could occur too<sup>36-37</sup>. In Kawasaki disease, coronary artery aneurysms occurring in the inflammatory phase of the disease, reduce the laminar flow through within them because of thrombosis and could cause myocardial ischemia<sup>1</sup>. Pericarditis presents with fevers and a friction rub in most cases. Myocarditis has always an associated tachycardia and usually a gallop rhythm. A preceding viral illness must be a clue for the family physician to suspect of these two diseases. A recent history of trauma may exist in some patients with pericarditis<sup>1</sup>. Sympathomimetic drug use including ephedrine exposure, marijuana and cocaine misuse may also cause chest pain by decreasing myocardial perfusion<sup>38,39</sup>.

**Table 1-** Differential diagnosis of Chest Pain in Pediatric Patients<sup>32</sup> (adapted from Bernstein D. Chp.422, History and physical examination, Section 2-Evaluation of the Cardiovascular System, Part XIX-The Cardiovascular system. In: Nelson Textbook of Pediatrics, 18<sup>th</sup> edition, Saunders Elsevier, Philadelphia, 2007, p.1858)

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#### MUSCULOSKELETAL (Common)

Trauma (accidental, abuse)  
 Exercise, overuse injury (strain, bursitis)  
 Costochondritis (Tietze syndrome)  
 Herpes Zoster (cutaneous)  
 Pleurodynia  
 Fibrositis  
 Slipping rib  
 Sickle cell anemia vaso-occlusive crisis  
 Osteomyelitis (rare)  
 Primary or metastatic tumor (rare)

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#### PULMONARY (Common)

Pneumonia  
 Pleurisy  
 Asthma  
 Chronic cough  
 Pneumothorax  
 Infarction (sickle cell anemia)  
 Foreign body  
 Embolism (rare)  
 Pulmonary hypertension (rare)  
 Tumor (rare)  
 Bronchiectasis

#### IDIOPATHIC (Common)

Anxiety, hyperventilation  
 Panic disorder, psychogenic  
 Precordial catch syndrome

#### CARDIAC (Less Common)

Pericarditis  
 Postpericardiotomy syndrome  
 Endocarditis  
 Cardiomyopathy  
 Mitral valve prolapse  
 Aortic or subaortic stenosis  
 Arrhythmias

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Marfan syndrome (dissecting aortic aneurysm)  
 Kawasaki disease  
 Cocaine, sympathomimetic ingestion  
 Angina (familial hypercholesterolemia, anomalous coronary artery)  
 Connective tissue disorders

#### GASTROINTESTINAL (Less Common)

Esophagitis (gastroesophageal reflux, infectious, pill)  
 Gastritis  
 Esophageal foreign body  
 Esophageal spasm  
 Cholecystitis  
 Subdiaphragmatic abscess  
 Perihepatitis (Fitz-Hugh-Curtis syndrome)  
 Peptic ulcer disease

#### OTHER (Less Common)

Spinal cord or nerve root compression  
 Breast-related pathologic condition  
 Castleman disease (lymph node neoplasm)

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#### Gastrointestinal causes:

Infrequently gastrointestinal disorders trigger the chest pain. Gastroesophageal reflux (GER) disease is a major problem<sup>40,41</sup>. Chest pain due to acute constipation could occur too<sup>42</sup>. Other chest pain causes include coin ingestion and trauma. Sabri et al.<sup>43</sup> denoted that epigastric tenderness was a key point which had differentiated the cardiac and non-cardiac chest pain origin and reduced unnecessary cardiac work-up.

#### Laboratory:

Routine ECG and chest radiographs are still main cost-effective procedures to determine a cardiac cause<sup>33</sup>. Very few pediatric patients with the symptom of chest pain will be found to have a cardiac disease. Troponin T, Troponin I, creatinine phosphokinase may be useful markers in the differentiation of musculoskeletal pain from angina pectoris<sup>44-8</sup>.

#### Approach to family:

Once the noncardiac cause of pain is determined, the child and his family should be assured that the underlying problem is not serious. Occasionally psychotherapy may be indicated<sup>49</sup>. Although the front-line pediatrician or family medicine specialist may strongly suspect that the chest pain has little or no significance, reassurance by a pediatric cardiologist is frequently helpful to the child and the family<sup>10, 49</sup>.

#### CONCLUSION:

Chest pain in the paediatric age group frequently originates from benign causes. Mostly it results from exertional musculoskeletal chest wall pain. Routine ECGs and chest radiographs should be implemented to distinguish the cardiac cause. Otherwise, a pulmonary or psychological origin can be thought. A long-term, trusting relationship with

the patient and their families is needed to reassure them and allow symptoms to resolve.

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